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PARIS UNIVERSAL EXPOSITION, 1867.

REPORTS OF THE UNITED STATES COMMISSIONERS.

REPORT

ON

EDUCATION,

BY

JOHN W. HOYT,

UNITED STATES COMMISSIONER.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1870.

INTRODUCTORY LETTER.

MADISON, WISCONSIN, 1868.

SIR: I have the honor to transmit herewith the Report on Education, which, as one of the Commissioners to the Paris Universal Exposition of 1867, it was made my duty to prepare.

The work has not been a light one. Important in character and considerable in extent as it seemed in its first general aspect, in the detail of accomplishment it has, of necessity, grown quite beyond the usual limits of such a report, while yet failing to meet the just demands of that great occasion.

If, therefore, because of insufficient time for their due preparation, or too limited space for their proper discussion, or for any other reason, I have failed to make a satisfactory and effective presentation of facts and conclusions, I shall, nevertheless, hope that some good may come of my endeavor to give a comprehensive view of the present condition of all classes of education in the countries there represented.

Very respectfully, your obedient servant,

J. W. HOYT,
United States Commissioner.

Hon. WILLIAM H. SEWARD,
Secretary of State.

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GENERAL SURVEY OF EDUCATION.

CHAPTER I.

INTRODUCTION—THE EXTENT OF EDUCATIONAL REPRESENTATION AT THE EXPOSITION.

THE VALUE OF EDUCATION IN SCIENCE AND ART SHOWN BY THE GREAT EXHIBITIONS—THE DEPARTMENT OF SOCIAL SCIENCE—THE GENERAL DISTRIBUTION IN THE EXPOSITION OF THE EDUCATIONAL EXHIBITS—NUMBER OF EXHIBITORS IN CLASSES 89 AND 90—THE VARIETY OF OBJECTS—NUMBER OF PRIZES AWARDED—THE GENERAL SCOPE OF THE REPORT.

The first universal exhibition taught this important lesson—that the most advanced nations were those in the midst of which, for the longest period and in the freest and most generous manner, science and art had done their work of enlightenment. The next succeeding ones not only enforced this lesson but added the important deduction, that prosperity and enlightenment are not accidentally coincident, but necessarily so; sustaining to each other the relation of effect to cause. When, therefore, the time came for determining the plan of a fourth universal concourse, in the spirit of a noble philanthropy that did honor to our common humanity, it was proposed that this great principle of progress should have practical recognition in the form of a separate division, or group, the scope and purpose of which warrant the designation happily given it by the Imperial Commission, of the "Department of Social Science"—a department whose office should be to set this grand law of development before the nations and in the most solemn and authoritative manner to commend it to the observance of all.

If Napoleon III had signalized his eventful career by no other shining act done in the interest of humanity, the imperial decree which opened Group X, and created "the New Order of Recompenses," "with a special view to the amelioration of the moral and physical condition of populations," should of itself place his name on the page of permanent history in letters of light, and insure to his memory the benedictions of mankind.

What may be styled the educational department of Group X, of the late Exposition, was embraced in two classes, (89 and 90,) appropriately placed at the head of the group, as relating to a subject thus acknowledged to be first in the logical order of such as directly concern the social improvement of man. But, inasmuch as the group itself could

have no definite assignment of place, owing to the diverse nature of the objects exhibited, it followed, as a consequence, that the exhibits in the educational department were distributed throughout the entire Exposition palace and grounds, thus making their inspection and comparison a protracted and somewhat difficult task.

The number of exhibitors in this department, properly catalogued, was no less than one thousand and ninety-five, distributed by nationalities as follows, the order of mention being that of the local succession of countries in the Palace:

Table showing the comparative number of exhibitors in Classes 89 *and* 90.

Nationality.	No.	Nationality.	No.
France	602	Sweden	14
Netherlands	4	Norway	(*)
Belgium	21	Russia	3
Prussia	16	Italy	69
Saxony	(*)	Pontifical States	1
Hesse-Darmstadt	2	Turkey	1
Baden	1	Egypt	2
Wurtemberg	53	Morocco	1
Bavaria	5	United States of America	(*)
Austria	86	Brazil	1
Switzerland	10	Argentine Republic	1
Spain	139	Sandwich Islands	1
Portugal	(*)	Great Britain	35
Greece	5	British Colonies	8
Denmark	14	Total	1,095

* Exhibitions made, but not catalogued; number not known.

The real number of exhibitors was considerably larger, as many of them made entry in other classes, to which the articles shown were also appropriated.

The objects themselves numbered many thousands, one entry—as that of a school-house, for instance—often including many individual articles collectively shown by the nation, society, or individual making exhibition.

The variety of objects was only less than their number, extending through the whole range appropriate to the work of education, and affording ground for a discussion of every educational theme, from the material appliances essential to the infant school up through every grade of intermediate schools, general and special, to the scheme of the royal academy or university. In the Park were school-houses, with furniture, apparatus, and numberless appliances, together with several pavilions, embracing a multitude of educational appliances used in schools of agriculture and mechanical industry, and the no less numerous products of the handiwork of the artistic or scientific skill of the pupils. In the Palace were numerous halls, alcoves, and attractive corners, filled with

charts, maps, atlases, globes, orreries, slates, copy-books, contrivances to aid in teaching children to read, write, and calculate; text-books from the primer to the calculus and the classics; schemes and reports of educational institutions of every grade and character; copies of annals published by educational societies, institutions, and states; the implements used in gymnastic exercises, and the appliances requisite to instruction in the arts of design, architecture, painting, and sculpture. Some of the halls embracing these, and countless other objects equally appropriate to the educational department, were very beautifully and effectively set off by portraits, busts, and statues of distinguished teachers and patrons of education in all countries, as well as by the inscription of the names and living words of such as, by their labors for the diffusion of knowledge among men, have made them immortal.

Of the relative importance of the exhibits made by the different nations, some idea may be formed from the following:

Table showing the number of prizes, of different grades, awarded to the exhibitors from various countries, in Classes 89 *and* 90.

Nations receiving awards.	Grand prizes.	Gold medals.	Silver medals.	Bronze medals.	Honorable mentions.	Total.
France	.....	9	47	87	135	278
Netherlands	.....	.....	.....	.....	1	1
Belgium	.....	1	1	2	6	10
Prussia and North Germany	.....	5	2	7	10	24
Hesse-Darmstadt	.....	.....	1	.....	.....	1
Baden	.....	.....	.....	.....	1	1
Wurtemberg	.....	1	1	1	4	7
Bavaria	.....	1	1	.....	.....	2
Austria	.....	2	5	6	9	22
Switzerland	1	.....	.....	1	1	3
Spain	.....	.....	1	5	13	19
Denmark	.....	.....	1	1	4	6
Sweden and Norway	.....	1	1	1	.....	3
Russia	.....	.....	1	.....	.....	1
Italy	.....	1	7	9	12	29
Pontifical States	.....	.....	.....	1	.....	1
United States	1	.....	2	.....	.....	3
Hawaii	.....	.....	1	.....	.....	1
Great Britain	.....	2	5	3	3	13
Canada	.....	.....	2	.....	1	3
Totals	2	23	79	124	200	428

In order to illustrate the extent of representative objects of the different kinds appropriate to Classes 89 and 90, as well as to convey an idea of their relative value in the estimation of the juries, the following

tables of the general classes of articles shown, and the number of prizes of different grades severally awarded, are also presented:

Prizes of different grades awarded in Class 89.

Specifications, Class 89.	Gold medals.	Silver medals.	Bronze medals.	Honorable mentions.	Total.
Governments and founders	8	7	1	.....	16
Primary normal schools	.....	.....	.....	1	1
Plans, furniture, &c	.....	1	6	16	23
Articles for infant schools	.....	.....	.....	1	1
Educational collections	.....	.....	1	1	2
Hygienic and gymnastic collections	.....	1	3	.....	4
Religious instruction	.....	.....	.....	3	3
Reading	.....	.....	3	5	8
Writing	.....	.....	6	15	21
Arithmetic and metrical system	.....	2	3	4	9
Accounts	.....	.....	1	2	3
Grammar	.....	.....	1	3	4
Geography	.....	5	3	10	18
Natural history	.....	.....	2	.....	2
Singing	1	5	8	6	20
Design	.....	.....	1	6	7
Sewing	.....	.....	2	1	3
Authors of primary works	.....	5	3	6	14
Editors	.....	4	6	9	19
Blind, deaf-mutes, idiots	1	10	7	14	32
Totals	10	40	57	103	210

Prizes of different grades awarded in Class 90.

Specifications, Class 90.	Gold medals.	Silver medals.	Bronze medals.	Honorable mentions.	Total.
Governments	.....	1	2	.....	3
Secondary normal institutions	.....	3	.....	.....	3
Classes and courses for adults	5	8	5	1	19
Special schools and schools of design	2	7	6	2	14
Models and methods	.....	1	4	10	15
Works of pupils	.....	.....	1	6	7
Special secondary instruction	1	3	5	5	15
Collections	.....	.....	7	13	20
Technical instruction—agriculture	1	3	3	2	9
Technical instruction—commerce	.....	.....	1	.....	1
Technical instruction—mechanic arts	1	8	10	3	22
Technical instruction—marine	.....	1	7	.....	8
Libraries, societies	1	3	6	9	19
Authors of reading books	.....	1	7	8	16
Authors of pedagogic works	.....	.....	.....	4	4
Authors of classical works	.....	.....	.....	12	12
Authors of agricultural works	.....	.....	1	6	7
Authors of industrial works	.....	.....	1	4	5
Authors of military works	.....	.....	.....	2	2
Editors of special works	.....	.....	1	17	18
Totals	11	39	67	104	221

In examining the foregoing tables, it should be borne in mind, of course, that the number of prizes subject to the control of the International Jury was limited—so much so that the examining juries had constant occasion to regret their inability to signalize the importance of very many contributions as they deserve.

The attention bestowed by the public upon the educational department was, doubtless, greater, because of the profound interest awakened in all intelligent minds by the creation and imperial consecration of the group to which it belonged. The number of French teachers alone, who visited and studiously examined its displays, was over twelve thousand. From all parts of the world, zealous men and women came expressly to avail themselves of such facts, principles, suggestions, and sources of information as it afforded; while of the more than ten millions of visits made to the Exposition, from first to last, it is fair to infer that a large proportion had reference, more or less definite, to some branch of it in Park or Palace.

From the foregoing outline, some conception may be had of the comprehensiveness of the plan of this great department and of the magnitude of its direct influence, as well as of the subsequent benefits likely to grow out of it.

It was a part of the general plan of the Universal Exposition of 1867, that the various nations should send personal representatives of their leading interests, charged with the duty of studying each particular department and of reporting thereon to their respective governments.

Under this plan, at rather a late day in the progress of the Exposition, the writer was designated as the Commissioner who should investigate the educational systems, condition, and progress of the several countries represented, and make such a report upon them as the facts might warrant and the welfare of the country demand.

The task thus imposed seemed so important in character, and yet so difficult of satisfactory accomplishment, that it must have been at once declined, but for the fact that he had just completed a third tour of observation, with direct reference to a personal knowledge of the educational condition of the more enlightened nations of the world—the first, confined to Great Britain, France, Switzerland, Rhenish Germany, and Belgium; the second, limited to the United States; and the last, embracing nearly every remaining portion of the European continent—and was therefore in possession of recent information, which, if wisely sifted and duly reported, could hardly fail to contribute somewhat to the establishment of correct ideas on the all-important subject of education in the United States.

Much valuable information on this general subject has been already diffused through the medium of able reports on European education; and numerous accounts of individual institutions and classes of institutions, by as many authors, have appeared in the newspapers and professional journals of the country; but all of these reports, and most of the special accounts, were published years ago, and are not, therefore, at this moment strictly illustrative of the various systems and institutions whereof they treat; while none of them have attempted a general survey and discussion of systems and classes, whether on the basis of a comparison of one with another, or as referred to an ideal standard suggested by the needs of our own time and country.

We still find the greatest diversity of opinion among our leading educators, even as to what is the best system for primary and secondary education; while on the subject of industrial, professional, and university education, there is, in almost every quarter, nothing better than a hopeful groping for the right way.

This last remark will sufficiently indicate the necessity for further light, as well as the scope of this report and the earnest purpose of its author, from whom, it is believed, no apology will be demanded for having, in some cases, in order to give a completeness to the survey, extended his inquiries and discussions beyond the bare exhibits.

CHAPTER II.

OUTLINE OF THE PRESENT CONDITION OF EDUCATION IN VARIOUS COUNRTIES.

THE SYSTEM AND CONDITION OF PUBLIC INSTRUCTION IN FRANCE—HOLLAND—BELGIUM—PRUSSIA—SAXONY—GRAND DUCHY OF BADEN—WURTEMBERG—BAVARIA—AUSTRIA—SWITZERLAND—SPAIN—PORTUGAL—GREECE—DENMARK—SWEDEN—NORWAY—RUSSIA—TURKEY, EGYPT, MOROCCO, HAWAII—BRAZIL—ARGENTINE REPUBLIC—GREAT BRITAIN AND IRELAND—CANADIAN PROVINCES—UNITED STATES OF AMERICA.

In order to make more intelligible the subsequent references to the different classes of educational institutions to be treated of in this report, as well as all discussions of them and the relations they sustain to each other, it seems proper, first of all, to present in concise form a general outline of the present condition of education in the various countries which, by virtue of their educational representation at the Exposition, have demanded my attention.

In pursuance of this plan, it is my purpose to present, first, the educational spirit and policy of each of the nations represented, with their general statistical results; and, secondly, the results as manifested in the condition of the several great classes of institutions everywhere recognized.

In the collection of statistics, I have necessarily depended upon the authority of others. No pains have been spared, however, in seeking the best sources of information, personal application having been made in many instances to the heads of departments themselves, and it is believed that, in general, they present a very correct showing of the state and progress of education in the countries to which they refer.

In considering the different nations, the order observed will be that of their local occurrence in the Palace of the Exposition, except as to the United States, which, for convenience, will be presented last.

FRANCE.

Since the year 1831, when the enlightened Guizot sent the no less able and distinguished Victor Cousin to Prussia to study and report upon the system of education in that country, much progress has been made by the cause of popular education in France.

Before that period, the imperial government and the subsequent royal dynasty had established and liberally supported many institutions for secondary, superior, and the highest culture; but the wants of the millions had been almost entirely ignored. The present, however, is full of activity and hope.

The French system of public instruction is all-comprehensive, embracing, alike, the highest and the lowest schools in the empire; the spirit which animates, and the power which controls and directs them, having their center at the throne, and diffusing themselves through the medium of officers of the departments, arrondissements, cantons, and communes, into which the empire is divided, thus reaching, or aiming to reach, the whole people.

The official classification of the schools for public instruction is usually: 1. primary, including all elementary and the lowest grade of normal schools; 5. secondary, comprising the royal and communal colleges, lyceums, and the second grade of normal schools; 3. superior, embracing the "academies" having "faculties" of science, letters, law, medicine, and theology, together with a single superior normal school.

The control of these several classes of institutions is vested in the imperial council of public instruction, formerly known as, and even yet constituting that theoretical body, the University of France; and consisting of the minister of public instruction, three senators, five bishops or archbishops, three councilors of state, three members of the court of appeals, eight inspectors-general, three clergymen belonging to the Lutheran, Reformed, and Jewish churches, five members of the Institute, and two heads of private educational establishments; the intention of the government being to give the various religious orders and institutions of the empire a fair representation in the school system, which is intended to fit all classes of persons for respectable citizenship. It is also worthy of note that this liberality of purpose observed in the constitution of boards, councils, and committees is traceable through all subordinate ramifications of the system.

All the members of this grand council are annually named by the Emperor; its meetings being semi-annual for the consideration of existing and amendatory regulations. There is also a council of thirty, with the minister at its head, entitled the superior council of improvement for special secondary instruction; a health commission of ten for all classes of schools; and a committee of patronage for infant schools, consisting of the archbishop of Paris, a senator, two chiefs from the staff of the minister of education, and twenty of the distinguished ladies of France.

Subordinate to the imperial council are regulations and officials not unusual in any important particular, yet usually ample and well-devised as by an authority intending to have itself felt and its results beneficial to the furtherance of the great end in view.

To insure efficient working and a faithful performance of duty by teachers in the various grades of schools, numerous inspectors are provided—eight inspectors-general for superior instruction, three for the faculty of letters, three for the faculty of science, and one for each of the faculties of law and medicine; eight inspectors-general for secondary instruction, four for letters, and four for science; four inspectors-general

for elementary instruction, and four honorary members of inspection, co-operating with each several class. There are also academy inspectors, numbering as many for all the academic districts as there are included departments. These inspectors are assisted by a rector, who is in charge of the normal and primary instruction for that district. More recently the infant schools are supposed to be under the supervision of the Empress, assisted by a number of ladies, salaried by the state, and numbering one for each academic district, which is the largest school division of the empire; and finally, there are a large number of departmental inspectors for the primary schools, amounting to one for each arrondissement, the civil division between a department and a commune, being no less than 363.

Private schools are allowed and encouraged, but instructors in these must pass the examinations required of those serving in the public schools; and the proficiency of their pupils and general school management are subject to a like oversight.

While it is obligatory upon the people to establish and maintain the required primary instruction in each commune, aid being given only when school fees and local taxes fail of sufficiency, attendance upon the schools is not obligatory. The age at which those who do attend pass out of any public instruction of this grade is determined quite as often by the ages at which they receive their first communion in the church to which they belong as by their attainments in school knowledge. For the Catholic church, this age is twelve; and for the Lutheran, sixteen. Thirteen-fifteenths of the French population is of the communion of the church of Rome.

Religiously considered, in the administration of its school system, the government is most judicious and liberal, recognizing the equal rights, before the law, of Catholicism, Protestantism, and Judaism, the three great generic and irreconcilable religions of Western Europe. Instructions in religion are given in all public schools; but no child is obliged to receive instruction in any creed denied by the parents; and in all cases where it is practicable and desired, separate schools for the children of differing denominations are provided. There is nothing in the law either requiring or disallowing this practice, it being, as in the question of mixed or separate schools for boys and girls, left to the circumstances of the communities and the discretion of the local authorities in charge of the schools. As a rule, there seems to be a preference for separate schools for the sexes and the religious orders.

The progress making by the government in diffusing the elements of popular education among its people is noteworthy. Thus, in 1832, when this subject began to be vitalized by a real national interest, the proportion of children between the ages of seven and thirteen in the primary schools was no more than 59 to each 1,000 inhabitants. In 1847 it had reached 99.8, and in 1863 116 for the same number. With a population of 37,382,225 of the 37,510 communes of the empire, only 818

were, in 1863, without schools; but the whole number of primary, including infant schools, was 72,069, showing that the actual total of these more than met the demand of the law. To the neighboring schools of the more wealthy and populous communes, the children of some of the other communes must have been sent, as the number in attendance reached 4,720,224. Of the population named above, the children between the ages of seven and ten were 4,018,427; and of the number in attendance upon primary public instruction, just given, there were between these ages 3,143,540, leaving over 800,000 who were out of school unless receiving public, secondary, or private instruction. Of the number of schools given, 3,308 were infant schools attended by 383,859 children under seven years of age.

The material aid rendered by the government for primary instruction varies with the years, but rarely equals half the amount actually expended upon them, the remainder accruing from fees of such as are able to pay and from local and departmental taxes, which last share equally with the public treasury in making up any needed sum. The amount voted from the general fund of the empire for public instruction of all grades was, in 1867, 21,268,121 francs, ($4,253,624,) of which $2,182,820 was for primary and secondary schools; the remainder, of nearly one-half, being devoted to that superior education of which France is so justly proud, and which is as much a part of its public school scheme as are the communal and infant schools.

This education is found in the academies, one of which is located in each of the sixteen academic districts of the empire, and in those superior institutions located in greater number at Paris than at any other European capital. In all of these academies are faculties of the sciences and of letters, the instructional force of which is formed by a total of 183 chairs, rather more than one-half being for the sciences. In eleven of them are faculties of law, with 98 chairs. Theological faculties, with 42 chairs, are found in seven of them, and medical faculties, with 61 chairs, in three; in addition to which there are superior schools of pharmacy, with 19 chairs, at Paris, Montpellier, and Strasbourg, the seats of the medical academic faculties, and over twenty auxiliary medical schools, with about 10 chairs each, in the principal towns.

The state aid to these academies in 1867 was 3,828,821 francs; to the Superior Normal School of Paris, 307,610; to the College of France, 277,000; to the Imperial Institute, 615,200; to the Museum of Natural History, 592,380; to astronomical establishments, 267,260; to the School of Living Oriental Languages, with its branch at Athens, 147,300; to the Academy of Medicine, 43,700; to the School of Charts, 37,800. In addition to this splendid array of public institutions found at Paris and thus liberally fostered, the grants of the same year to the University, Imperial, and public libraries amounted to 696,000 francs; to the aid of savans and men of letters, 200,000; to the Society and Journal of Savans, scientific missions, and other subscriptions, scientific and literary,

300,000; to the encouragement of the instructional corps and to classical works, 60,000; and to the collection and publication of unedited documents relating to the history of France, 120,000.

HOLLAND.

Public instruction in Holland is divided into the usual grades, with primary schools, ordinary and superior, in one of which all private ones of this class must rank.

The scheme of organization is simple. The minister of the home department is the supreme officer in charge of this interest. The eleven provinces of the kingdom are divided into eighty-nine school districts, and these into communes, in each of which there must be a primary school in the care of a local board; and each commune of 3,000 persons has a school commission. For each district there is an overseer, who is chairman of all the commissions within his jurisdiction. At the head of the districts embraced in a given province is a provincial inspector, salaried by the state, whose duty is to superintend all the schools in his province, receive the reports of district overseers, and once a year to sit in the council of provincial inspectors, under the presidency of the minister, upon the general interests of primary schools throughout the kingdom.

Secondary instruction is provided for and looked after with an equally Dutch straightforwardness of action.

Children are admitted to these schools without distinction of creed; and while it is the avowed purpose to have primary instruction "tend to develop the reason of the young and to train them to the exercise of all the Christian and social virtues, the teacher is to abstain from teaching, doing, or permitting anything contrary to the respect due to the convictions of dissenters." In short, the teacher is expected and enjoined to cultivate the Christian virtues, but is prohibited from teaching any form of theological doctrine. Religious instruction, outside of the family, is left to the different communions, the school law favoring no one of them, though it expressly provides that "school-rooms may be used at the convenience of any of them, for the religious instruction of children attending the schools, out of school hours."

Primary schools must be in operation throughout the entire year, except during the time of recognized holidays.

The support of the primary schools, as in most countries, is required of the communes, which must also furnish them in sufficient number, the state deputies and the government being judge of that sufficiency. In the event of a commune proving unable to support the needed schools, the province in which it is found and the state share equally in meeting the expense.

The law further provides for a liberal minimum compensation to teachers, and that the communes furnish them a residence and garden.

It also fixes the maximum number of children to be placed under the care of an unaided teacher.

Attendance upon school is not obligatory; but is made practically somewhat so, by prohibiting parents from receiving relief from charitable institutions whose children have not been duly instructed in the elements of a popular education.

In 1857 Holland numbered about 2,500 primary schools, with nearly 5,000 masters and assistants, and an average attendance of 322,767 pupils. Of private schools there were nearly 1,000, and of infant schools 800, having an aggregate of 133,435 more.

An estimate of the results of these schools may be gathered in various ways outside of the school reports, which are not of very late date. In 1857 a speaker in the national legislature complained, as in evidence of a deplorable state of ignorance in that portion of the kingdom, that of the conscripts of South Holland, the worst educated portion of the kingdom, ten per cent. were unable to read and write. A parallel comparison of this with the wholly uneducated number found in the service of many a more pretentious country than old Holland would have induced more bitter complaints in the interest of humanity, or greater respect for the institutions of his own.

Commissioner Arnold, sent out by the council of education of Great Britain to investigate the school systems of certain countries, in his report of 1860 says, in speaking of that of Holland: "It is impossible to regard it without admiration. I do not think we can hope, in England, for municipalities which, like the Dutch municipalities, can be trusted to provide and watch over schools; for a population which, like the Dutch population, can be safely trusted to come to school regularly; for a government which has only to give good advice and good suggestions to be promptly obeyed."

In 1867 Holland appropriated to all its schools, of every grade, 1,605,695 florins.

In secondary, and especially in technical or industrial secondary, instruction, there is a great interest. Schools of various specialties connected with the industries of the people, embracing Sunday schools and evening classes, have been instituted in recent years and are doing much toward bettering not only the material but educational character of the laboring classes, who, from their former almost exclusive limitation to the pursuit of agriculture, and that but rudely practiced, have been the least informed and most unskilled general workmen in Europe. At the same time, the quality of their higher burgher schools, seminaries, and athenæums for intermediate education has correspondingly advanced in the interest of letters and philosophy.

These special schools are largely supported by municipal and private means; but the state also not only encourages but aids, when needed, all such enterprises. The amount of public grants to secondary and special secondary schools and associations is about $50,000 annually.

Charitable institutions are unusual in number and well sustained. Superior education has its universities at Leyden, Groningen, and Utrecht, which, besides revenues from endowments, are fostered by both public and private means.

BELGIUM.

The school system of Belgium is very imperfect, yielding but inferior results.

As in France, the kingdom is divided into provinces, corresponding to the French departments, arrondissements, cantons, and communes. The minister of the interior performs the functions of minister of public instruction.

The law recognizes the following classes of schools:

1. Primary, including communal schools, founded, supported, and administered by the communes; private adopted schools, often a substitute for the communal, and receiving a consideration for instruction given; and private free schools, usually those of denominational orders, and which admit poor children gratuitously.
2. Superior elementary, or high schools.
3. Secondary, or intermediate schools, preparatory to the university, and known as Atheneums.
4. Normal schools, primary and secondary.
5. Superior schools—universities with faculties of philosophy, medicine, law, and theology.

The public communal schools are established and managed by the communal authorities, which are practically quite independent as to their establishment at all; though, if done, the schools are subject to the supervision of the government through cantonal inspectors appointed by the minister. It is the duty of the inspector, whose term is three years and who receives a per diem for service rendered, to visit each school within his canton twice in each year, and report to his next official superior, the provincial inspector. Of provincial inspectors there are nine; one for each province. They are appointed in like manner, with corresponding duties for their province, besides that of presiding at the cantonal conferences of teachers and making a report of the proceedings, as well as of all inferior inspectors, to the minister of education.

Once a year these provincial inspectors meet in council at Brussels, under the presidency of the minister, to consider all educational interests that may arise.

Teachers can only be appointed, upon favorable examination by a clergyman and a layman, from among candidates who have had at least two years' training in an approved normal school; and when appointed, are removable by the inspector, upon consultation with the communal council.

In the superior elementary schools, it is provided that one of the best in each province may incorporate into its scheme a course of normal in-

struction for persons fitting themselves to teach in the lower schools. Provision is made in the organization of the Atheneums for instruction in various industrial branches.

In addition to these courses, normal and industrial, separate schools are founded for higher advantages in acquiring proficiency in the art of teaching and in the application of science to the pursuits of life.

Superior education is furnished in two universities of the state, at Ghent and Liege, and two outside of government patronage, that of Louvain being Catholic, and that of Brussels liberal.

In special culture, there are schools of arts, manufactures, mines, and civil engineering, in connection with the state universities, and a superior commercial institute at Antwerp.

The policy of the government is, like some of its European neighbors, to give as little assistance as is possible to elementary instruction, and keep good the right to superintend its character and operations—that of the Belgian authorities limiting it almost within the encouragement given to communal school-house building, by loans of money to that object, returnable within a given number of years. From 1842, when the present school regulations were adopted, to 1851, there was such a decline in the public interest growing out, as it seemed, of the voluntary policy permitted in the communes, that few of them either owned or provided school buildings. At that date the government opened a credit of 1,000,000 francs with the communes in aid of school-houses, so that at this time they own some 2,500, capable of accommodating over 256,000 pupils. Still, looking at the condition of the education of the common people as favorably as possible, Belgium presents the spectacle of a militia of which scarcely over thirty per cent. can read and write, and a school population, two-thirds of which commence the labor of life in self-support without the rudiments of anything that can be called education.

Secondary and all intermediate education fares better, but is yet unsustained, in any just sense, by the public treasury. When superior and special institutions are considered in reference to the ways and means of their existence, the state shows to better advantage in the two universities of its care and those independent, giving instruction to nearly 2,000 students, while meeting more than half of the annual expenses of such schools as prepare for the higher professional positions of life.

It supports schools for the blind and deaf-mutes, for orphans, and for juvenile criminals. It liberally sustains a national observatory, about 20 public libraries, three conservatories of music, with more than 1,000 pupils incited to excellence by liberal rewards, and more than 50 schools and halls for drawing, painting, sculpture, and architecture, which together instruct scarcely less than 10,000 students, all of which institutions are aided or supported by public funds.

PRUSSIA.

First among the nations to adopt systematic regulations for the instruction of the people, and faithful to this policy through the strifes and upheavals of more than three hundred years, Prussia is fully entitled to its present rank as first in the educational world.

Owing to the war of 1866, and the absorption, as a consequence, into the kingdom of a number of the smaller states of North Germany, the school system of Prussia is undergoing modifications. At the date of this writing, however, none of these have been promulgated, even if determined upon, and this account must be understood, therefore, as referring to the period immediately preceding that great event.

The principal divisions are provinces, of which, in 1866, there were ten, and these are subdivided into regencies, circles, and parishes.

Its system of public instruction wears the features of a strong government. At its head stands the minister of education and of ecclesiastical and medical affairs, and a central council, of which he is president. This council is divided into sections corresponding to the three general interests of the department; the one devoted to the establishment and care of schools being the educational cabinet of the minister, and occupied in devising plans and executing such measures as meet with his approval and have the sanction of the law.

Next below is the provincial council, having general control of secondary education, and primary normal schools. A subdivision of this consistory (*Schulcollegium*) has charge of the primary schools of its province, being empowered to execute the statutes made and provided, and to decide upon the use of text-books, subject to the approval of the minister, to whom all its transactions are reported.

Immediately below this is the church and school section of the supreme council of the regency, charged with the examination and appointment of teachers in the primary schools, with keeping the schools in good condition, and with collecting and disbursing school funds. It is presided over by the school councilor, (*Schulrath*,) who is a member of the regency council, and entitled to a seat in the consistory of a provincial council, to which, on behalf of the church and school committee, he makes report.

The educational officials of a circle are the councilor of the circle (*Landrath*) and the inspector, a clergyman, whose duty to watch over the schools of the several parishes of his circle is an essential part of his ecclesiastical functions. Finally, each parish must have its school, and each school its committee of supervision, (*Schulvorstand*,) consisting of the curate, two magistrates, from two to four notable persons of the parish, and its inspector, usually the parish clergyman.

In the larger towns and cities the general management of all the schools is intrusted to a board called the school deputation. This board consists of the burgomaster, (mayor,) members of the municipal council,

pastors, and directors of the higher schools, while there is also a committee of management for each school.

Each of the heads of council, from the highest to the lowest civil division of the country, is appointed by the government, and each has the power of veto over the acts of the council, board, or committee over which he presides, and, in certain cases, over the appointing or elective school privileges of the people. Thus the entire school system is in the hands of the central power at Berlin.

The schools rise in gradation in the following order: Elementary, lower burgher, higher burgher, real, pro-gymnasia, gymnasia, and universities. There are, besides these, normal schools of the three grades, and a great variety of special schools devoted to instruction in the practical arts, in the application of science to industry, in liberal professions, and in the fine arts.

Religious instruction is an invariable rule, though the state expressly provides that "children whom the law allows to be brought up in any other religion than that which is being taught in the public schools, cannot be compelled to attend the religious instruction given in the same." The latest regulations upon this subject (1851) are to the effect that, "in the people's school all possible regard shall be had to denominational relations, and religious instruction left to the conduct of the respective religious bodies." As a rule, where Protestants and Catholics are each in sufficient number to render it practicable, separate schools are established. Any parish, however, may have a mixed school, if there is general agreement to do so, and the authorities concur. Most of the public schools are open to all children of proper age and qualifications, without respect to sex.

In regard to support of schools, each parish must maintain its own, if able, and being unequal to the charge, the circle, the province, and the state join equally in meeting the expense.

Provision is made for teachers in exemption from military duty during their studies, preparatory for and when engaged in instructional service, if, in the opinion of the authorities, they cannot be spared from their work; also, for compensation while thus employed, and for support when no longer able to serve. The number of pupils that may be placed under the care of one instructor is always regulated by law.

While attendance is strictly obligatory upon the schools provided during school age, from seven to fourteen—unless by special permission—parents furnishing instruction in other ways are not released from support of the public institutions. To increase the necessity for the education of children whom poverty or the avarice of parents might tempt to place at work, to the neglect of school opportunities, the law prohibits, by severe penalties, the employment of any person under sixteen years of age, unless satisfied by certificate from the school authorities that he has a knowledge of the required rudimentary branches of education. Exceptions are made in cases where an employer of large numbers of

young persons maintains a good school, at his own expense, for the instruction of his employés during a certain number of hours each day; and a default to furnish any child in such employ this opportunity, three times in five years, forfeits to the employer the right to forever after engage in his service any under that age.

The Prussian government, while dispensing from its general funds only so much as is needed to make good the deficit in local taxes and school fees for primary instruction, does yet, by its school enactments and liberality, so keep equal to their demand the great body of its people, that all ranks and denominations seem to have a common pride in the maintenance of their position as leaders of popular education. And since the people are the basis of all financial possibilities within the dispensation of public authorities, their readiness to contribute to all classes of secondary, special, and superior schools must be equally great, since, besides its nearly 25,000 common schools, with an attendance of about 3,000,000 children, Prussia presents an array of institutions of the higher and highest rank no less honorable to its liberality and wisdom. No enumeration of these will be made here, as in the body of this report there will be frequent occasion to refer to them in illustration of the grades under discussion. In no country in the world, however, is the public outlay of means for schools of all classes more liberally responded to by the popular, voluntary purse—a standing argument against the few who undertake to make it appear that the people who are compelled to have elementary education do not value it, or make haste to add to it; and a perpetual memorial to other nations in favor of popular school instruction.

SAXONY.

The systems of public instruction in the other states of North Germany differ so little in their main points from that of Prussia, from which they have been largely borrowed, that special accounts of them, save of Saxony, are deemed unnecessary. Indeed, the system of this excepted state is not materially different in other respects than that of a most admirable adaptation to the needs of a smaller kingdom.

Aside from this, and perhaps as the best reason that could be assigned in favor of a special notice, is the highly important and honorable position so long occupied by this little kingdom in the educational world; and all the more is this due, since it is the last time its distinct existence, as a kingdom, can be chronicled.

Before its incorporation with the body politic of Prussia, growing out of the war of 1866, and with a population little over 2,000,000, ninety-eight per cent. Protestant, it had of primary schools, equal to any in the world, 1,974, with a corps of 3,589 teachers, and 331,854 pupils—the school attendance from six to fourteen years of age.

The schools of secondary, special, and superior grade embraced a uni-

versity and a polytechnic institution, and one, each, of scientific research, mines, forests, the arts and trades, surgery, military, artillery, cadets, and normal, for training teachers of gymnastics. It had 9 superior normal schools, 5 of architecture, 5 of commerce, 7 real schools, 25 gymnasiums, 4 of weaving, 25 of lace-making, and schools for the blind and deaf-mutes.

The great university of Leipsic, and the world-envied gallery of paintings at Dresden, will be spoken of as the possessions of Saxony long after the obliteration of its distinct political existence has ceased to remind of its former rank among the proud old states of Europe.

THE GRAND DUCHY OF BADEN.

The people of Southern Germany have characteristics distinguishing them from those of the northern states, and modifying their school systems.

The great divisions of Baden are into four circles, these into 74 bailiwicks and again into 1,595 communes.

The old system of public instruction, which was harassed by a multiplicity of religious questions, was thoroughly revised and readopted in 1864; but owing to the liberal spirit with which the new code treated the subject of religious control of the schools, the clergy made violent opposition to its practical adoption. In this crisis the Grand Duke, Frederic III, honored his administration, and conferred lasting benefits upon the cause of education, by a maintenance of constitutional rights; and from that time the operation of the system has brought most desirable results.

The main points of the law are these: The executive administration of the minister of the interior, aided by a council of one from each circle. The immediate charge of the primary schools, which are of two grades, (simple and superior,) is in the priest or pastor of the commune, the mayor, or a member of the municipal council, and the teacher, as ex officios; to which is added a number greater than these, elected from the people by the school patrons. In the larger communes the physician and rabbi are added to the ex officios. This council appoints inspectors, who visit each school once in three months; while for the district, in place of the former inspector, who was priest or pastor, the government provides and salaries inspectors who may not, during the time of such service, engage in any other employment, and who are well qualified for their position.

Teachers in these schools must first graduate from a normal institution, and, after passing a rigid examination, serve three years as assistant in a public school before passing a final examination, and then, only, upon receiving the verdict of "very capable," can he secure the position of teacher in charge of a primary school of even the lowest grade.

The character of these schools, which, for a population of less than 1,500,000, numbered, in 1867, 2,157, may be judged from the prescribed

course of instruction in the simple, or very first of the elementary, class. The studies pursued are religion, German, arithmetic, geometry, natural history, history and geography, natural philosophy, writing, drawing, singing, gymnastics, and needle-work. In the superior primary schools the same branches are taught and advanced, with the addition of the history of the constitutional institutions of the country and the elements of the French language.

With this most broadly laid basis for an elementary instruction, obligatory, or its equivalent, upon all, and its polytechnic institution of Carlsruhe, in some respects the most remarkable of its kind in the world, for special professional culture in scientific directions, Baden presents, moreover, schools of almost all other classes worthy of its enterprise and growing enlightenment in education and the interests thereby advanced.

WURTEMBERG.

Foremost among the German states to adopt a liberal and thorough policy of public instruction, the little kingdom of Wurtemberg still holds honorable rank.

Elementary education was made obligatory as early as 1810, and has been confirmed by subsequent legislations of 1824 and 1864.

The administration and care of schools are much the same as for other German states. With the home minister at its head, there are circle superintendents of co-ordinate powers from each of the three great religious orders, for secondary schools; inspectors of common schools; directors of teachers' conferences; and last, the communal councils elected by the patrons, and with presiding officers appointed by the King, and committees of citizens for the assessment of school taxes.

The several denominations are upon equal footing in all school privileges, and separate schools may be established at the expense of the whole community, when it is desired by sixty families of a given denomination.

The law requires every community of thirty families to have a primary school. In case the number is less than that, except under circumstances of isolation and peculiar embarrassment of locality, as small a community as fifteen families may have a school decreed them; or, if more convenient, so small a number may unite with the nearest established school.

Those aspiring to the office of teacher must give notice of the intention of following that pursuit, and after two years' preparation for a course of normal instruction, to which they are not admitted until seventeen years of age, must here complete a three years' course under an excellent master; and then, having served two years as an assistant in an approved public school, may stand the chance of passing examinations that admit them to the honor of teacher in charge of an elementary school. Here, as in many of the European states, the guardianship of

the office of the teacher is most excellent, and worthy of the consideration of all who are interested in the proper training of children.

The normal schools of this kingdom are of a superior quality, even for the usually fair grade of this class in other countries, with tuition entirely free, and assistance, in the way of board, for the candidates who are poor but promise well for the office of teacher.

As before stated, attendance is compulsory, and neglect of parents to comply with the terms of the law is visited first with fine and then with imprisonment; and, in the failure of these, the school police may take such charge of the children themselves as will bring them into school. If ill health does not permit attendance, and the child is yet able to study at home, and the parents are unable to supply it with instruction there, the school authorities may provide it at communal or state expense, as the contingencies of the case may demand.

So rigid is the government in the determination of making the results of the school law good in spirit as well as letter, that provision is made for requiring the attendance of pupils one and two years longer than the prescribed age, in the event of their not being able to pass a final examination of creditable scholarship in the courses that have been pursued. To this is added the enforced attendance upon some Sunday-school, after leaving the primary, until the eighteenth year, unless the child is, during that time, under instruction in some school of higher grade.

Further, no child is allowed to learn any trade, or enter any occupation, or to receive pay in any service whatever, who cannot show a certificate from the authorities of having answered the demands of the school law.

The primary schools, as in Baden, are of two grades, the courses pursued embracing about the same branches, the number of which schools, for this small kingdom of a little more than 1,500,000 souls, is about 15,000.

At the head of its superior education stands the old University of Tubingen, with extensive botanical gardens and anatomical collections, a library of 60,000 volumes, 6 faculties, and 1,200 students.

Between these, besides an unusually large number of denominational and independent schools and seminaries, there are more than 50 real schools of the first and second grade; 6 Latin schools; 7 gymnasiums; of normal schools, agriculture, and philosophy, each, 3; 6 lyceums; of schools of commerce, forestry, architecture, polytechnics, and the fine arts, each, one.

As in the republic of the Alpine Mountains, with its wide-awake little cantons, each vying with the other in developing the intellectual resources of its people, or as among the sturdy Dutchmen of the sands rescued from the sea, one is tempted to pause on the threshold of this comparatively unimportant territory in contemplation of the real importance of each individual and communal effort in the furtherance of any great humanitarian work.

BAVARIA.

With a population of over 4,500,000, the Catholic majority of which exceeds by about 2,500,000 all other denominations, Bavaria has an exceedingly thorough and liberal system of public instruction founded upon the largest religious toleration.

The school divisions of the kingdom, its administration, care, support, together with regulations for qualifying teachers, attendance, &c., are not materially different from those of other German states.

The primary schools may be either mixed or separate, denominationally considered, under provisions based upon the expressed wish of a given number of families; and when mixed, the required religious instruction is imparted by the pastor of each sect represented by the pupils.

Even when, by permission, parents provide private instruction for their children, or when these are in attendance upon any other than the public institutions, all such pupils are required to attend, once in each year, upon the examinations held for those under care of the state, that, in no case, so far as can be ascertained, a child may pass beyond the school age without the average of elementary school attainments. Upon attaining the sixteenth year, whether from home, private, or public instruction, each girl and boy, without regard to rank in life, must have a certificate of such attainments as the law prescribes, or go into life barred of all such opportunities of occupation and remuneration as would otherwise be possible.

The figures of latest reports show a very efficient state of the primary and a more than creditable status of other schools; every primary school by law, and many others by choice, having a garden attached for the practical instruction of pupils in the growth and care of trees and plants.

In the catalogue of schools between the primary and the universities, of which there are several, a decided prominence is given in number and character to such as relate to the trades and arts, and to the fine arts; Munich being the capital, and standing in the relation of art *alma mater* to the other German states.

Pecuniarily, besides fees from parents, a local and provincial tax, the schools for primary instruction are on the basis of a generous state budget, and the government aid to all classes of schools needing assistance is of a most commendable liberality.

In view of such a state of things there is no danger in predicting that, ere long, the five per cent. of its people unable to read and write will be very speedily reduced to not one in all the land.

AUSTRIA.

A statement of the number and classes of schools found within the Austrian empire would give evidence of a satisfactory condition of education in that county. Besides the eight universities of its superior

instruction, there are 65 lyceums of philosophy; 2,138 gymnasiums; a number of professional and technical schools, and of lower, secondary, and primary almost enough to make a school, of some sort, for each parish. But where there is a spirit of national interest, and a really efficient working in the public school system of a country, there will not be found any difficulty in procuring its records and statistical reports. Such reports, with the freshness and accuracy of a people awake to so great an interest, could not be found. Again, it must not be forgotten that the schools now established suffice for a population of 36,000,000.

Justice to the liberal spirit, both in and outside of the government, demands, however, that there be taken into the account of its present condition the difficulties with which it has to contend in establishing anything like a national system of public instruction. Principal among these are the great diversity of its populations, with no homogeneous principle of unity among them, and the powers of a church and an aristocracy, both averse to the liberal diffusion of knowledge among the masses of the people. These, like an incubus of great darkness, have rested for generations upon the vast possibilities of its intellectual development.

In view of all the circumstances, the actual number and grades of such schools as do exist are creditable to the government.

The general system of organization embraces a council, superior and subordinate, of superintendence and inspection, in which the civil and church authorities are of equal numbers and powers, the whole under the control of the minister of education.

The classification of schools is similar to that of Prussia, though the inferior primary schools are quite below, and the superior ones much less numerous, and all less efficiently managed than those of its enterprising neighbor.

The qualification of teachers and school attendance are so loosely provided for, and so little looked after, that the average actually in school, from seven to twelve years—the Austrian school age—is but little over fifty per cent. for the whole empire. In the German provinces, where the people come more directly under the influence of a liberal culture of other people, the statistics show, in a population of 12,000,000, a superior grade of higher schools, and of primary 11,158, with a boardof instruction numbering 17,853, and an attendance of 1,645,816 children, making a per cent. of the school population of, for different portions and years, eighty-six and ninety-four.

In 1864 the municipal council of Vienna made a step in advance of any portion of the kingdom by establishing in each of the eight parishes of the city a superior *Bürgerschule*, (citizens' school;) and later, by memorializing the council of public instruction, to the end of securing to their national system the efficiency of that of Prussia.

While considering the ways and means of providing for such changes as were involved, the Austria-Prussian war of 1866 seemed to delay so

desirable an accomplishment; but the more immediate contact of the less cultivated Austrian soldiery with the better educated and victorious Prussians, and the fact that not only their own government, but the intelligence of all civilized peoples, attribute the advantage of the latter to the more thorough mental discipline acquired in their schools over that of the comparatively uneducated enemy, are telling with more certainty than human prescience could have predicted upon the Austrian demand for a better popular education.

SWITZERLAND.

The Swiss system of popular education possesses peculiar interest to the people of the United States, owing to the general resemblance it bears to our own. There is, in fact, no national system, each cantonal division of the republic, of which there are twenty-five, having its own system complete.

An account of these, in detail, would be neither profitable nor practicable, and a mere outline will be given of what, for the want of a more fitting term, may be called the school system of Switzerland.

The spirit of this system is at once Christian and democratic. Its administration rests primarily in the cantonal minister of public instructions, with shared or delegated aid from a board made up of three or more members elected from the communes, or sections, which are the only school divisions known to the cantons. These communal directors are, one for each, elected by the people to look after the school of its locality, and furnish, at discretion of the minister, a board, of such as he may select therefrom, to co-operate with him for the general good of the entire canton, which answers substantially, for the purposes under consideration, to the State of our federal Union.

The gradation of the schools is essentially German; and for the inspection there is a plan adopted similar to that noticed in several other countries—the communal inspectors reporting to the cantonal, and these to the minister, in regard to whatever relates to the fulfillment or evasion of the law and the general condition of the schools.

The provisions for securing good teachers are admirable, and in evidence that it is far enough from either the theory or practice of the Swiss citizen to consider a poor teacher as better than none, or a better teacher, at advanced pay, more expensive than one less qualified at a cheaper rate.

Attendance is obligatory in most of the cantons unless it can be shown that children not in the public schools are receiving equally good instruction in private schools or at home; and even then, so jealous is the state in its guardianship of this great interest, children having instruction outside of the public schools must undergo examinations to ascertain whether their proficiency equals that demanded by the system publicly administered. In some of the cantons the prescribed school age is from seven to fourteen, and in others from six to sixteen.

Notwithstanding this generally enforced acceptance of the instruction provided, there is a large margin in the construction of the law as to the length of the school year, and provision made for allowed discontinuance, after the twelfth year, of such children as are very inconveniently situated, or who are a necessity to poor and infirm parents.

The policy in regard to the support of the schools is much the same as that in Germany, and a general interest is maintained in them as vital to both individual and national prosperity. Whether their children attend these schools or not, all persons liable to taxation contribute to their maintenance; and eight days before each annual commencement, a copy of the school law is sent to every person interested in its observance.

The gymnastic and military exercises connected with the public schools form a very interesting feature, and help to keep good the popular enthusiasm in regard to them. So much importance does the government attach to this branch of the public instruction that it sends each year, at its own expense, suitable young men to the great gymnastic establishment at Dresden, to qualify themselves to teach the best practices of the world in their own institutions. The skill of improvement and adaptation to their home needs, with which these "best practices" of other countries are adopted, has often been noticed by foreigners, and from a distinguished French school commissioner brought the statement, "that Germany might well send, in its turn, some of its best subjects to study gymnastics in the cantonal schools of Switzerland."

The results of the school systems of the several cantons are so satisfactory to the republic, and so interesting in some of the separate states, that there is a strong temptation to give a few of them in detail.

In Bern, the largest canton of the confederacy, there is a population of less than 500,000. Here we find 1 university, 2 cantonal schools, 1 real (practical) school, 2 for deaf-mutes, 6 normal schools, 5 pro-gymnasia, 30 high schools, 144 private institutions, and 1,393 primary schools, with a school budget of $185,851, usually a very small portion of the real expenditure of the Swiss schools.

In Zug, the smallest of the cantons, with a population of less than 2,000 inhabitants, there are 1 gymnasium, 1 superior school for girls, 2 normal schools, 3 Latin schools, 5 high schools, 5 private schools, 12 schools of improvement, and 45 primary schools, with a budget of $10,133. Of this canton Mr. Baudonin says: "Of all the cantons, Zug is that one which most glories in developing and improving its system of elementary instruction, all parts of which are closely linked, from the A B C of the infant school to the university and the polytechnic school at Zurich."

In Zurich, with scarcely more than 250,000 of population, besides having the honor of possessing the great university and the polytechnic school for the confederacy, and the usual array of normal and high schools, and schools for the unfortunate, we find no less than 514 primary schools,

about 75 classical, and 320 schools of labor, giving instruction to nearly 10,000 of such as, while they must learn to work, may still learn to think.

One cause of the efficiency of public action in the cantons of confederate Switzerland ought not to be overlooked. While the population of the country is of diverse nationalities and represents extremes of devotion in the great classes of religionists—Catholic, Protestant, and liberal—it has been the policy of the several governments to tolerate all religious beliefs; nay, to treat all alike generously, but, at the same time, to enforce the duty of public instruction, notwithstanding the opposition of any sect. In this work Switzerland has had a fair amount of hinderance, but in evidence of the independence of the state in this regard may be cited a resolution, passed in 1867 by the grand council of Bern, the substance of which sets forth, "that the absolute obedience which members of religious orders owe to their superiors being found incompatible with legal requirements concerning instruction, no persons belonging to such orders shall henceforth be employed upon the public educational staff, and that all such persons now employed are to be considered as having resigned."

SPAIN.

One of the first European states to establish great universities in the Middle Ages, and for subsequent centuries the nurse of science as well as the "cradle of great captains," for the past hundred of years Spain has so lagged in the great march of the nations that the world has well-nigh lost all hope of seeing her ever awake and put on new energy for the fulfillment of a mission more in harmony with the spirit of modern times; but the past few years have shown that she has not yet gone into hopeless decay—that she too has shared in the educational impulse destined to reach every portion of the earth, and is now determined to advance to an honorable position among the more progressive and enlightened nations.

Public education in Spain is under the general direction of the minister of public works, commerce, and instruction, and a royal council—embracing six sections, to wit, primary instruction, philosophy, ecclesiastical science, jurisprudence, medical science, and administration of public instruction.

The general division of instruction is into primary, which is gratuitous and obligatory by law; secondary, which includes the colleges and all institutions of like character and grade; superior, or faculty education, which embraces the university courses; and professional, which is given in the special schools for music, painting, sculpture, and architecture, bridges and highways, forests, arts and trades, &c. The clergy, which has its courses and theological faculties in the universities, has, besides these, over sixty episcopal seminaries, in which there is a wide range of studies, leading from the Latin grammar up to the doctorate. In 1864 these ecclesiastical colleges numbered 23,614 pupils.

In presenting the extensive and highly interesting collections destined to have place in Classes 89 and 90 of the Exposition, the Royal Commissioners for Spain made the following very encouraging statements:

"Within the past few years primary instruction in Spain has had considerable development, in consequence of the many encouragements that have been given to this interest by the government and of the sacrifices imposed upon themselves by the municipalities. In fact, the expenses incurred for the *personnel* and *matériel* of the schools amount to a third of their budgets. Since the publication of the law of the 9th of September, 1857, which regulated the pay of teachers, and fixed the proportion that each center of population should pay, according to the number of inhabitants, in aid of primary education, the number of schools has increased prodigiously, and has even doubled within the last ten years. We can certify that now there is not a single hamlet that has not its teacher and the necessary resources for the maintenance of one school for each of the two sexes. If we add, moreover, that this same law has rendered primary instruction obligatory, in granting to judges the power to condemn to a penalty, the extent of which varies according to the offense, all parents who do not send their children, between the ages of six and nine years, to the schools, we shall have the explanation of why the schools have multiplied in so short a time and the number of pupils reached a very considerable figure; also the ground of our hope that in a few years Spain will, in this respect, have nothing to envy the most civilized nations of Europe.

"This result, so satisfactory, has been obtained also through the creation of normal schools, which have been improved by successive special regulations, and which each year furnish the necessary number of teachers of every grade. These schools have also facilitated among all classes of society the means of acquiring those primary ideas which are the basis of more extensive information in every department of knowledge. On the other hand, the provincial inspectors have rendered important service since the date of the creation of that office, whether in stimulating the zeal of municipalities for the establishment of new schools or in inciting teachers to give instruction as extended as the faculties of their pupils and the circumstances of the locality will permit."

The objects exposed in the educational classes of Group X embrace every department of primary instruction, together with a great number of popular scientific and other works designed for a wider diffusion of knowledge among all classes of the people, and, in the aggregate, were a most welcome indorsement of these words of the Royal Commission, as well as additional warrant for the reference I have myself made to the future of education in Spain.

PORTUGAL.

Public education is even more backward in Portugal than it was in Spain twenty years ago.

The schools are primary, secondary, (chiefly lyceums,) and superior,

(including all above secondary.) These interests are under the direction of the minister of the home department and a royal council.

The regulations in regard to teachers and the obligatory education of children are fair in letter, but none of them are enforced with spirit and energy, so that the number of schools, and of children in attendance upon such inferior ones as do exist, is lamentably small.

GREECE.

It is not possible to think of the past glory and present wretchedness of Greece without sad reflections upon the transitory nature of even national eminence.

Greece, once the intellectual mistress of the world, adorning its civilization with the triumphs of her genius in every department of art, science, literature, and philosophy, to-day a feeble community, ranking but as a petty kingdom, and that only by the grace of nations having no existence in the days of her ancient glory!

But there are still sparks of living fire in the embers of her departed greatness, and we find her, through representative lovers of learning, demanding a place for educational contributions in the Universal Exposition of 1867.

Under the system of instruction inaugurated within the past quarter of a century, no little progress has been made in diffusing the blessings of education among all classes of the people. Over 50,000 children are now in the primary schools, over 5,000 in the Hellenic, (a secondary school based upon the study of Greek,) some 2,000 in the gymnasiums, over 600 in the University of Athens, and a considerable and yearly increasing number in the normal, industrial, scientific, and professional institutions.

DENMARK.

The Scandinavian states have long been noted for the excellence of their common schools and the universality of rudimentary education among the people.

In Denmark popular education has been provided for and fostered by the government for more than three hundred years. Under the law, operative since 1814, the general control of this interest is in the hands of a minister of public instruction and subordinate superintendents for the several departments of the kingdom.

Each parish is obliged to furnish good primary-school buildings, with teachers for the instruction of children in reading, writing, arithmetic, the Lutheran Catechism, grammar, history, and geography. There are normal schools for the training of teachers, which add to these more primary branches studies in mathematics, the natural sciences, pedagogy, gymnastics, drawing, and music.

The secondary schools are high or grammar schools, and furnish instruction in the Danish language and literature, in Latin, Greek,

French, and German, and advanced courses in mathematics, the natural sciences, &c., and are found only in larger towns and cities—about thirty in number for the entire country.

The schools are well managed, and bring corresponding results, the profession of schoolmaster being honored and education valued.

Schools of superior rank are liberally sustained and patronized, the income of the University of Copenhagen reaching to nearly $75,000, with an attendance of students there and at the University of Kiel, which has an income of about half as much, and libraries embracing 175,000 volumes.

In special education, there are schools polytechnic, military, naval, of forestry, and medicine, an academy of the fine arts, and those usual for the unfortunate.

From the first movements of the state in the direction of popular education, it was compulsory, to the extent that the church refused confirmation—without which no person could be employed, apprenticed, or married—to such as could not read and write; and under the present law it is unconditionally imposed upon all parents that their children shall receive instruction in some approved school from seven to fourteen years of age, and the law is respected and effective.

SWEDEN.

The government of Sweden nobly began the work of popular education almost two hundred years ago, demanding of every youth who would be confirmed by the church—without which the royal road to marriage and all the avenues of success in life were closed to him—that he should show that he was able to read and write. The result of this intelligent and thorough educational policy, well followed up by the adoption of improved systems, is that at the present time, while occupying an inhospitable and half barren country reaching north to the Polar Sea, Sweden probably has as small a per cent. of persons within its borders who cannot read and write as any country in the world.

The Swedish system embraces the usual classes of schools, the primary being mainly under the control of the clergy, who are of the Lutheran faith. To each diocesan consistory, having care of all the schools within its ecclesiastical jurisdiction, inspectors appointed by the state have, more recently, been added, the improved condition of which testifies to the advantage secured.

The law of 1864 required the establishment of a school in each parish; but the sparseness of the population in portions of the country rendered the law, of necessity, inoperative, and the authorities fell back upon the perambulatory system that had been so successful in Norway. There are at this time more than 16,000 of these itinerant schools held for a few weeks, or for a few days in each week, in given localities, and furnishing instruction to about 125,000 pupils.

In the more thickly settled portions of the kingdom the parishes are

divided into districts, each having its permanent school, the whole number of which is over 2,000, with 150,000 in attendance; in the higher public schools are 6,000; in private schools, 20,000; 150,000 educated at home—making a total of nearly 500,000 receiving public primary instruction, or some education of equal value.

The quality of the culture secured at these schools may be judged from the studies pursued in the most elementary of them, and everywhere advanced and improved upon in the permanent schools of towns. These studies are religion, the Swedish language, geography, mathematics, Swedish and general history, natural history, writing, music, drawing, and gymnastics.

The legal minimum compensation of a teacher is not so much money, but an amount of the necessaries of life, such as corn, firewood, pasture, a garden, a house, &c. If a faithful teacher and well liked, he may expect to, and usually does, receive more from the school patrons; but this much he is guaranteed, and in case of failure in the school district to meet his needs, the government comes to his aid.

Attendance upon the schools is obligatory between the ages of nine and fifteen.

Secondary education is given in schools of learning—corresponding to the pro-gymnasia of Germany and grammar schools of England—gymnasia, and apologist schools. The first two afford instruction in the higher mathematics, Greek, Latin, German, and French, and are preparatory to the university. The apologist schools teach the same, with less of the classics, and answer more nearly to the real schools of Germany.

Normal and special instruction can be had, to a considerable extent, in its 8 normal schools, 1 school of agriculture, 2 horticultural schools, 7 schools of forestry, 9 schools for the arts and trades, 1 for naval construction, 9 for navigation, and an extensive polytechnic school.

Superior education still flourishes in its two ancient universities of Lund and Upsala, with their 77 professors and 1,500 students.

NORWAY.

Although a portion only of a kingdom, Norway, by its heroic efforts, under adverse circumstances, to educate all its children, deserves an independent place in the educational review of nations.

Owing to the non-existence of facilities for the prosecution of the trades, its population is mainly agricultural. It is also so sparsely peopled for the area occupied—not much more than one acre in one hundred being of any practical value under cultivation—that the maintenance of permanent schools is not attempted. Accordingly, while each parish is provided with a school-house or a school-room, the schools of great sections of the country are occasional blessings, coming only at certain months of the year or specified days of the week, the teacher passing like a missionary from one school to another. There are in Norway

about 200 of these traveling schoolmasters, carrying the bread of knowledge to 150,000 children of that sterile land.

Of permanent district schools there are some 200, educating an average of 20,000, and over 60 schools accommodating their instruction to the wants of 7,000 laborers.

In the towns, besides excellent common schools, there are between twenty and thirty high schools, for the better education of the children of the middle classes, though open to all who seek them.

In the principal towns are colleges for preparation for the university at Christiania, with its time-honored character, its 30 professors, and its 1,000 students.

Many of the special schools and the usual range of charitable institutions are found here, and are well sustained.

The law enforces the establishment, and by some means the maintenance, of schools for the education of all its children; it sees that the children are in the schools when established, and that they have appropriate courses of study and faithful instructors. To this end but little aid is given directly by the state, and yet, with a resoluteness worthy of all honor, the sturdy Norsemen manage somehow to command the means, and accomplish the acceptance of their use to the universal education of their children.

RUSSIA.

This grand empire is making no less rapid strides in educational matters, under the enlightened policy of the present Emperor, than in the development of its vast resources and the general amelioration of the political and social condition of its population.

Since the foundation laid for intellectual culture by Peter the Great, universities and other institutions of a high order have had an existence in several of the larger cities. So long, however, as a large majority of the people were slaves, and it was the policy of the government to keep them so, scarcely anything was done for the establishment of a grade of schools lower than professional and gymnasia—such as were essential to the education of the nobility, and to qualify the few for different branches of the civil service. But the shackles of serfdom were no sooner knocked off than the people began to call for schools. Even the late serfs undertook, of themselves, in many instances, the work of establishing them; so that, while in 1861 there was scarcely a public school for the peasantry in the empire, at the close of the second year of their emancipation 8,000 schools had sprung up, all of them for and supported by this class of persons.

The government, also, recognizing the necessity of education for the people, has adopted measures for the multiplication of schools of every grade. Nor has the educational movement stopped here. The church has awakened to this great interest, and is more actively enlisted in the

cause of education than ever before, so that the schools supported by the church alone furnish instruction to nearly or quite 350,000 children, and the total number of pupils under instruction in the whole empire has advanced since the date of emancipation from less than half to more than a million, increasing the proportion of children in school from one in one hundred and fifty to one in sixty for the entire population.

Just previous to 1864 the budget of the minister of public instruction had grown to 950,000 rubles, of about seventy-five cents each. In 1864 the Emperor had determined to establish many new parish or village schools, and, accordingly, 450,000 rubles more were added, making the total of that year for his department (the military, naval, engineering, and other like schools being under the universities) of 1,300,000 rubles. In 1865 the public aid to education had increased to 6,467,452 rubles. It should be borne in mind, however, that a large proportion of these sums was for secondary and superior schools—the parish schools for elementary instruction being carried on, as in other European countries, with but little help from the state.

The school division of the empire is into great circles, (ten,) provinces, districts, and villages or parishes. It was the original intention to have at least one university at the chief city of each circle, a gymnasium at the capital of each province, a lower secondary school in each district, and a primary school for every parish, the officers of the university circle to have general supervision of the schools of the three subordinate grades.

In the departments of secondary, superior, and special education so much of this plan has been realized that Russia now possesses seven well established universities, with a total of 600 professors and 6,000 students; one superior normal school at the capital and several of lesser rank; three lyceums; over 90 gymnasia; about 500 district schools, (equal to American high schools;) some 70 theological seminaries; law schools apart from the universities; independent schools of medicine, surgery, and pharmacy; two or three schools of high order for instruction in the oriental languages, with over 1,000 pupils; two academies of the fine arts, with schools of art, instructing more than 1,000 students; a normal agricultural institute, and nearly 100 agricultural schools of various grades; an imperial school of mines, with 10 district and 70 primary mining schools scattered over the empire; one central and several subordinate polytechnic schools; 15 schools relating to naval and marine affairs; two schools of engineering; numerous technological institutes and industrial schools; together with general and special libraries, and a rapidly increasing number of scientific, literary, and industrial societies of almost every class known in the world.

At the present rate of its educational development, it cannot be many years before Russia will be entitled to rank among the most enlightened as well as the most powerful of nations.

ITALY.

In common school education, Italy finds herself in the same category with Spain, though far ahead of that country in the condition of science, letters, and art, as well as in the number of her institutions of higher learning, and in the multitude of her learned men. With all the glory that belongs to her as the nursing mother, for more than twenty centuries, of letters, of jurisprudence, of medical science, and of physics, as well as of art, the masses of the people are still in darkness. But Italy, too, has once more felt the electric touch of liberty, and to-day her educational Cavours, Victor Emanuels, and Garibaldis, with "Free and Universal Education" as their watchword, are now waging a war against ignorance and intolerance that must drive them, ere many years, from that beautiful and classic land.

The first efforts for the improvement of the instruction of the people began in Tuscany and Lombardy, under the stimulation and direction of Lambruschini, Thonar, and other distinguished educationists, through the medium of the journal of education known as the "Guida dell' Educatore," and quickly followed by the publication of valuable text-books for the schools, were not only successful in the provinces where they originated but extended themselves into other portions of northern Italy. But this was about the time of the enthusiasm awakened in many parts of Europe by the introduction of the Lancasterian method of teaching; and after a most extraordinary multiplication of blocks, charts, and other appliances for the schools that were exceedingly faulty, the work of progress lapsed, leaving the whole field of education in a fog of uncertainty as to means and methods; so that the present work of sifting methods and wisely directing the new movement, to be done by the educational leaders of Italy, is even more difficult than the pioneer work of their predecessors.

On this head, the author of "L'Italié Économique," in 1867, published by authority of the royal commission representing that kingdom at the Exposition, makes the following remarks: "At this moment, schools, books, methods, and instruments multiply themselves; but, it is necessary to say, without order, without preconceived direction. There are in the schools a few good books, in the midst of a multitude of bad ones, and such of these books and instruments as are esteemed and used in one province are unknown in another. The misfortune is, that no one knows for himself, and no competent person has taken it in hand to examine all these things and determine which to exclude and which to adopt for the use of the schools. If the Exposition should teach this alone, it would confer an immense advantage. A discernment, grave and assured of the best books, best instruments, best geographic charts, and best methods in use, even now, in all Italy, would contribute much to their diffusion and aid a revolution the most salutary that one could desire at this moment. Then would there work out for itself a career of progress, after the example of the most civilized nations, and perhaps

make apparent what distinguished and impartial men have already affirmed, viz., that in the matter of public instruction Italy posseses a richness of which she has not yet become sufficiently conscious."

The contributions of Italy to Classes 89 and 90 consisted of a great variety of books, charts, models, and other appliances in common use in the primary schools of that country—the number of collection entries being fifty-two—together with numerous reports, statistical, and other documents issued by the Society for Popular Instruction at Florence, and other institutions; and including, moreover, many remarkable specimens of the industry and artistic skill of the pupils in some of the technical schools, and, as a whole, constituted an exceedingly interesting study.

The educational statistics so well illustrate the intellectual condition of Italy that I cannot forbear a sufficient extension of this notice to include the most important. In 1864 (date of the latest statistics accessible) there were 31,675 schools for primary instruction, with 1,681,296 pupils instructed by 49,246 teachers; 1,427,063 of the pupils being children, and 254,233 adults. Distributed as to space, there was one school for each six kilometres[1] square, and for every 549 inhabitants; and one pupil for every 14 inhabitants. If we take the number of children of school age, (two to twelve years,) that is, of such as ought to be inscribed as belonging specially to the school population, there was one school for every 139 children, and one pupil for every 3.74 children.

In the total of pupils the boys and girls were in the proportion of 60 to 40. In the primary schools, the boys were to the girls as 100 to 85; in the secondary, as 100 to 6.

The public schools were to the private as 3 to 1. In the public schools, the average number was 42, (26 boys and 16 girls;) in the private schools, 22, (8.5 boys and 13.5 girls.) For the preparation of teachers there were 135 primary normal schools of different grades—64 for males and 71 for females—numbering 7,083 pupils; of which 2,718 were male and 4,365 female. The number of masters approved was 1,600; of mistresses, 2,017.

The average expense of each public school is 575 francs—three-fourths for personal service, and one-fourth for material. Of the total amount of money expended for primary education for that year, the government contributed 0.066; the provinces, 0.022; the communes, 0.761; the remaining 0.151 being derived from rents and different revenues.

The number of secondary and technical schools of the same date was 1,029, to wit: 466 gymnasia; 123 lyceums; 177 technical schools, and 363 ecclesiastical gymnasia and lyceums. Of all these classes of schools 219 are under the direction of the government; 276 belong to the provinces and communes; and 271 to private persons, exclusive of the 363 ecclesiastical establishments. The total number of pupils in the secondary schools was 53,432—26,142 in the gymnasia; 4,672 in the lyceums; 8,831 in the technical schools; and 13,787 in the ecclesiastical seminaries.

[1] One kilometre equals 1,083⅓ yards.

The total cost of maintaining the governmental schools in 1864 was 4,234,287 francs, divided among the three classes as follows: To the gymnasia, 1,878,422 francs; to the lyceums, 1,196,086 francs; to the technical schools, 1,159,779 francs. The average expense was 20 francs for every 100 inhabitants. For every 1,000 francs of this revenue, 61 came from the rents of patrimonies; 469 from the government; 429 from the provinces and communes; the remaining 41 from different revenues.

The expense of educating one pupil in the lyceums and gymnasia was 180 francs, (about $36;) in the technical schools, 145 francs.

Of technical institutes there were, in 1865, 157, created mostly within the past few years; of universities, 20, fifteen under the direction of the government and five free, that is, independent.

The amount of the budget of the minister of public instruction, for 1866, was $2,865,786; of which $617,044 was for secondary education; $206,788 for primary, and the remaining $2,041,954 for the higher schools and universities.

TURKEY, EGYPT, MOROCCO, HAWAII.

Each of these countries contributed to the educational exhibits of the Exposition. Each has a department of public instruction provided for and managed, to a certain extent, by the state.

BRAZIL.

The imperial plan for the education of the people of Brazil is mainly very liberal; but owing to the vastness of the empire, its area being a little greater than that of the United States, and the sparseness of the population—the total being less than 12,000,000, and the average of the most populous province scarcely exceeding thirty inhabitants to the square mile—the difficulty of carrying the provisions of the law into force is very great.

The law requires the establishment and maintenance of two primary schools—one for boys and one for girls—in each parish, and, at least, one school of secondary rank (lyceum or college) in every principal town. It also provides for the establishment and support of various superior and special schools, of which there are many already in existence.

Public schools, for primary instruction, are of two grades; the branches taught in those of the lower order being simply rudimental, in those of the upper grade such as are taught in the intermediate and high schools of this country.

In the municipality of the imperial capital, primary and secondary schools are under the immediate control of the government and of the general assembly, and are inspected by the minister of public instruction, an inspector general, a council director, and district delegates. In order to obtain authority to teach, the candidate must show that he is of legal

age, (twenty-one years to teach, and twenty-five years to direct a college,) to prove his moral character, and his capacity. If the candidate be a married woman, she must also show her certificate of marriage; if a widow, a transcript from the mortuary register recording the death of her husband; if divorced, the decree by which divorce was pronounced. Persons who would teach in, or direct, private schools are likewise subjected to these same tests.

Religious instruction is given in all the schools, though not necessarily in accordance with the Catholic faith, unless a portion of the pupils are children of Catholic parents; in which case the director, though a Protestant, must provide a priest for the Catholic pupils.

Pupils of both sexes are not permitted in the same school, and in establishments designed for girls, no person of the other sex, over ten years of age, is allowed, except the husband of the principal.

Primary instruction is gratuitous, and, according to the law now in force, it is to be made obligatory as soon as the government shall deem it advisable to put this provision into execution.

The number of pupils in the public primary schools in 1867 was reported, by authority of the government, as exceeding 107,000; the proportion of girls to boys being as 28 to 79. These figures are said to convey a very imperfect idea of the number of children actually instructed in the several provinces of the empire, because of the large number of private schools not included in the statistical returns.

Secondary instruction, though not entirely gratuitous, is liberally sustained by the government. The number of pupils in the secondary schools, public and private, is estimated at 2,718 for the municipality of the capital, and 4,771 for the provinces, in which both primary and secondary schools are managed by the provincial presidents and legislative assemblies, in a manner modeled after the imperial administration.

Among the superior and special schools may be mentioned the following: two faculties of medicine, with annual government aid amounting to 211,770,000 reis, (about $105,885;) two faculties of law, receiving about $77,650; 11 theological schools, all subsidized by the state but one; several military schools, receiving annual aid to the amount of $151,445; one naval academy, receiving $57,714; one commercial institute, receiving $9,000; one institute, each, for the blind and for deaf-mutes, receiving $25,989; an academy of fine arts, receiving $18,650; and a polytechnic institute, together with several scientific and philosophical societies, a national museum, and a national library of nearly 100,000 volumes, all either wholly sustained or aided by the government.

The Emperor has the purpose to establish a great national university, comprehensive in its scope, and employing the best material and talent the government can command, and commissioners are already at work perfecting a plan.

THE ARGENTINE REPUBLIC.

Owing to internal dissensions which so long distracted the peace of this republic and retarded its development, whether material, social, or intellectual, education has here made but little progress. Since its organization, there have been a few institutions of higher grade in the principal towns, but scarcely any schools in the country districts of any of the provinces.

Popular education has yet to be instituted. Laudable efforts, to this end, have been made through a series of years by a few leading men, chief of whom has been the learned, liberal, and patriotic Sarmiento, late minister of the republic to the United States, and, I am happy to add, President elect of the republic in whose educational cause he has so long labored.

During former visits, as well as at the time of his recent residence in our country, this distinguished gentleman has been most indefatigable in collecting and digesting information upon the subject of popular education, with a view to making it practically useful to his own country. In this call of his appreciative countrymen to the high duty of directing the affairs of the nation, there seems to be good ground for the hope that with his administration will begin the noble work of establishing a broad and liberal system of education for its 1,355,000 people.

GREAT BRITAIN AND IRELAND.

In the revision of the educational code of Great Britain, adopted in 1867, will be found some noticeable improvements bearing upon the condition and prospects of its elementary schools.

An annual sum of money is granted for public instruction administered by the department of education, of which the lord president is head. The object is to promote the education of the children of manual laborers. The means used are to aid local effort to establish and maintain elementary and normal schools for the instruction of children and training of teachers for this department. All schools receiving aid from this grant must be in the interest of some recognized religious sect, or have daily readings from the authorized Scriptures. They must also be open to the inspection of persons appointed by her Majesty in council, the committee on education having consulted with the religious bodies interested before nominating inspectors, who may not in the least interfere with the religious instruction given, or with the management of the schools, their duty being simply to ascertain whether the conditions of the aid given are fulfilled, and to report to the department.

Aid to establish schools in building, improving, and fitting up schoolrooms and dwellings for teachers, is limited to the amount contributed by proprietors, residents, or employers of labor in the parish, or within four miles radius of the school. No aid is given to establish normal

schools, buildings and fittings being obtained by voluntary contributions from those interested.

Aid is given to maintain both elementary and normal schools, upon the conditions hereinbefore named, to which are added the attendance and proficiency of pupils, and the qualifications and faithfulness of teachers.

Endowed schools, to receive aid, must meet the conditions required of those of lower grade, the annual grant to a school of this class being reduced by the amount of endowment income, the reduction being omitted when both grant and income do not exceed 15*s.* per scholar by average for the year.

Normal colleges, to which the normal schools are inferior departments, have aid to the amount of £20 per annum for each master, and £14 for each mistress—until the sums have reached, respectively, £100 and £76—who, having been trained there for two years, have completed the prescribed probation and obtained certificates for teaching in the same school until, with an intervening year, they have had two favorable reports from inspectors of the same, or been reported by the proper authorities as having completed a like period of service as elementary teacher in the army or royal navy, the poor, law, industrial or reformatory schools.

Masters and mistresses who have been trained for but one year may obtain certificates upon the same ground as those for two, in which case five annual grants of one-half the above-named sums are made to the institutions where they have been instructed.

The early history of education in Scotland compares more than favorably with that of England. Almost four hundred years ago it was enacted that children of the barons and freeholders should be sent to the parochial schools from the ages of six to nine years, and after that to seminaries of higher grade. Neglect of this duty met with a penalty very severe for the fortunes of the times. Later, and almost two hundred years since, legal steps were taken for the establishment of a school in every parish, with provision to assess the lands for that purpose.

Compulsory attendance has been the policy of the Scottish government; and the support and position accorded to instructors of youth from that early time, with the advance since made, not only in salary for service, but in the quality of that rendered, show that it has been the intention to magnify the office of the teacher, and to make the school-room tell upon the national prosperity both at home and abroad.

But as the old plan of leaving the education of the people pretty much alone has been found, in England, incompatible with the growth of liberal sentiment in the world and the growing importance of *the people*, so the old systems of schools in Scotland have proved unequal to the advancing needs of the times, and both countries are now experimenting as to the ways and means of a more efficient national scheme of public instruction.

The provisions of the revised code apply to Scotland, and in the statistics given it is included with England.

From reports of 1866, the number of schools inspected was 13,586, with an average attendance of 1,082,055; and the parliamentary grant for public elementary instruction, including normal schools, was £693,078. In addition to this, the cost of inspection, with that of the office of administration, amounted to £75,030.

The entire expense of these schools, including, besides government aid, income from endowments, school pence, voluntary contributions, and other sources, amounted to £1,333,887. The number of normal or training colleges for the same year was 48, and the public aid received by them, £74,873; the actual cost of their support being £102,693.

The total of public grants for elementary instruction from 1839, when the present educational code was adopted, to 1866, was £8,883,272, of which normal schools have received £1,206,229.

It being the policy of the government to help only those who are able to help themselves, it appears that, nothwithstanding these figures of actual outlay, there were yet, in 1866, 11,635 parishes, representing a population of over 4,000,000, in which, out of 2,099, only 2 in each 11 received any public assistance for schools; while of the poorer parishes, with less than 1,000, and the still larger number with less than 500 inhabitants, 10,404 were not reached to the least amount of aid; and that in the city of London alone, there were 156,000 children without instruction.

Deplorable as are these facts, they will still be found to compare hopefully with the statements made in 1850, by Sir James Kay, (now Shuttleworth,) and upon authority of her Majesty's inspectors into the condition of primary instruction in England and Wales, that there were then nearly 8,000,000 adult persons in those countries who could not read and write; and that of children, between the ages of five and fourteen, less than one-half were receiving any school training.

But while the great cause of education for the laboring masses has reason to arraign the policy of this wealthy and powerful land, England has done better by that secondary and superior culture whose fruits have fallen to the more favored of the middle and the higher classes. But even here, the plan of aiding most liberally the superior institutions, which must always be for the smaller number, is very noticeable; a most reprehensible neglect of ascertaining the condition and results of all intermediate schools having been, until quite recently, the habit of years past.

Investigations into this class of institutions, embracing the entire range of endowed grammar schools, proprietary and private schools, reveal beyond the fears of the least confident, that they are severally and together inadequate to the wants they propose to meet.

The commission of 1864, authorizing an inquiry into the state of secondary education for the United Kingdom, was limited by that of 1858 for primary, and that of 1861 for the nine great public schools of Eton,

Winchester, Westminster, Charter-House, St. Paul's, Merchant Tailors', Harrow, Rugby, and Shrewsbury. These schools were educating about 3,000. Besides these nine there were, in 1864, in England and Wales, 782 endowed grammar schools, with an income of £209,448, and attended by 36,874 boys. The proprietary schools of this grade had an average of 12,000 on their lists of pupils, making a total of 52,000 boys receiving what passes for secondary education, but which the commission pronounces in many cases not to exceed in value that of primary schools. Still, allowing it to be of its assumed character, out of 255,000 youths of the age and condition to demand secondary instruction, less than one-fifth can get it in any but strictly private establishments.

The distribution of these endowed schools is also a hinderance to such general usefulness as they might else have; located as they were at the time of their foundations, and now existing without regard to the more pressing needs of populous over those of less densely peopled districts. Another cause of complaint was found in the ambition of many masters to send numbers to the universities, and the very general practice of sacrificing those for whom no such promotion was contemplated, and who, at best, could have but a limited time in these schools, to such as were intended for superior culture. The extent of this school loss to so large a number as are involved, may be judged from the fact that, out of 700 grammar schools aiming to prepare pupils for the universities, but 153 actually accomplish this fitness, and these only in an average of from 19 to 1½ in each period of three years.

The great cause of this yearly increasing inefficiency of the endowed schools seems to have been an almost total lack of public interest in looking after them, and of any state oversight in managing the funds left in trust for their support, before the spirit and claims of the present time could have been foreseen. The facts of this negligence find illustration in the statements of the commission, that cases were found in which the overcrowded school was so far below grade that but one boy out of sixty could write correctly, from dictation, a sentence composed of words of but one syllable. In other schools there were masters with but six, four, and two pupils; and, in one case, but one. In still another instance, a master had held the position and for over thirty years drawn the salary for service, and had not one pupil during the time.

As a class, the statement is made that more than one-fourth of these schools were practically inoperative, because the masters, appointed for life, were blind, or deaf, or past work. The proprietary and private schools, ranking as secondary, are decided by the commission to be both better and worse than the grammar schools.

The character of the management of the Scottish schools of this class has produced results of great superiority over those of England; and it having been made the duty of the commission of inquiry into their condition to suggest means of improvement, recommendations based upon the better features of the Scottish administration have been made.

The principal of these refer to consolidating endowments too small to be of much practical value, grading them, and providing for the payment of masters in accordance with the amount and quality of service rendered.

Thus it will be seen that the entire subject of popular education is undergoing the regeneration of an aroused public interest and state care, such as it has not before received, and from which may reasonably be expected results worthy of the times and the cause.

In superior education, the universities of Great Britain speak for themselves; those of Oxford and Cambridge being a glory to the nation that has fostered them. These two universities are permanently endowed, and are also aided, as needs arise, by private and public means. With a board of instruction of professors ordinary, extraordinary, and tutors, numbering about 250, they are educating an average of about 1,000 students. The four universities of Scotland (Edinburgh, Glasgow, Aberdeen, and St. Andrews) are likewise of early date, and on foundation endowments mainly equal to their needs; and, with an instructional force of less than 100, are giving training in the department of superior culture to 3,500 young men.

In schools for special education there is an awakened interest, the universities to some extent having added courses upon applied science, and institutions for professional scientific culture springing up independently, or claiming co-ordinate rank with those already existing. References to the principal of these will be found under their appropriate groupings, in the several divisions of this report.

The system of public elementary education in Ireland, as in England, depends, to some extent, upon parliamentary grants administered by a board composed of both Catholic and Protestant members. The chief point of difference in the systems adopted for the two countries, is that of England undertaking to combine secular with religious instruction in some denominational interest, while that of Ireland is to separate these as far as possible in the schools. The minority of Protestant influence there is gradually yielding this point to the Catholic majority, and the latest revision of the school code of Ireland, in 1866, gave prominence to this feature. The effect sought—that of a more hearty co-operation of the whole people who patronize the public schools—is believed to be thus advanced.

The number of schools reported in 1866 was 6,453, with an average attendance of 321,901. The annual public grant to these primary schools is about £350,000. There is in Dublin a normal school, besides 25 district and inferior schools of this class, all of which have an attendance of 12,000 pupils. The board of elementary school instruction assists, also, 145 workhouse schools, giving instruction to 20,000 children; 19 schools in connection with prisons; 138 convent schools; 104 agricultural school farms, and four school gardens.

In superior and special education, Ireland has the University of Dublin, with an income of £50,000; and colleges at Belfast, Cork, and Galway, all of which, besides endowment incomes, are quite liberally aided by public funds.

There are various literary and scientific schools and societies, institutes and academies of arts. The Museum of Irish Industry, established at Dublin, attracts to its scientific school large numbers of students, at which point charitable and professional institutions of higher grade are mainly located.

A more careful survey of the statistics of this portion of the United Kingdom will result in the conviction that it is neither educationally nor morally so far behind the general status of the whole as is very generally supposed.

THE CANADIAN PROVINCES.

The system of public instruction in these provinces is, in each, somewhat different, and altogether so composite, and in process of such changes, that any detailed account of them is deemed inexpedient for the purpose of comparison. That there is a very general interest in the subject and an earnest movement in the direction of finding the most approved methods of other countries, is manifest from the assimilation of some of the best points of the American and European systems.

The marked feature of the school policy of both provinces is that of encouraging rather than requiring the maintenance of any plan of public primary instruction.

The administration of the school code is in the hands of a council in connection with a chief superintendent, elected for life, with local superintendents, county, township, and section trustees. The face of this is promising enough, but the working out of it is bad enough, for reasons that will presently appear.

Under the voluntary system, while it is left to the council to regulate all matters connected with the maintenance of a normal school, with its dependencies of model schools, and for the organization and classification of common schools; to recommend text-books, and make regulations for the support of worn-out teachers; and to the superintendent to see to the outlay of all public moneys disbursed for the schools, and to the administration of the same; it is yet left to the section trustees to determine, not only the number and character of the schools, but, indeed, whether in that section there are any public schools at all. These trustees, three in number, elected by a majority of the freeholders present at the meeting for this purpose, hold office during three years, and for that period the fate of public instruction is in their hands, the law requiring nothing, but simply empowering, at their discretion, action within given limits. They

have in custody all school property of the section, and do as they judge best in regard to building, repairing, renting, warming, and furnishing school buildings; in employing and dismissing teachers, &c.; and upon default of the annual meeting of freeholders to decide, or their decision as to ways and means proving inadequate, may themselves determine in which of the ways approved by law the schools of that section are to be maintained. These provisions are by voluntary contributions; by rate-bills not exceeding, for the country districts, twenty-five cents per month for each child in attendance; or by a rate, equal to meeting the demand, upon the entire taxable property of the section.

As a rule, the smaller the number of persons actively employed in discharging a given duty—provided they are competent and interested—the better the duty is performed; but I doubt if the educated intelligence of any country in the world is equal to meeting such responsibilities as this plan leaves to men likely to be thus selected.

There is in Upper Canada an income arising from the sale of lands for that purpose, known as the grammar-school fund. This money is distributed at the rate of $400 to each senior (county seat) grammar school which has an average of over ten scholars, and of $200 if below ten. The amount of these payments having been deducted from the income of the fund for the year, the remainder is, through the superintendent, distributed to all the other grammar-schools of the province, according to conditions made by the council of public instruction. Should the sums thus derived be found unequal to the support of a given school, a municipal tax and a small rate-bill levied upon the pupils are resorted to.

A fund of $20,000 for superior education is annually provided by parliament and distributed among the collegiate institutions.

Specially considered, the educational fund of Lower Canada is divided into that for inferior and superior education; that for the first is dependent upon the annual rate of the legislature, the latter is derived from suppressed estates of Jesuits, other supplementary sources, and the annual grant of $20,000.

The application of this money embraces in its scope not only the higher institutions of learning, but academies, normal and model schools, and whatever comes above the grade of elementary instruction. It is also provided by law that, if the income of this fund falls in any year below $88,000, the deficiency may be made good by a draft upon the common-school fund.

Under the operation of the systems in the provinces of Upper and Lower Canada, there were reported, in 1863 and 1864, 7,737 elementary schools with a gross enrollment of 557,547 pupils; for Upper Canada, about one in four for the whole population, though the average for the year shows but thirty-eight per cent. of the enrollment. The total expenditures of these schools for the year was $1,874,712, out of which sum $274,927 came of public appropriation.

During the same year there were 5,352 pupils reported as in attendance upon grammar schools, at an expense of $85,910, $44,274 of which was from legislative aid, and which averages about $900 to a school, and $16 per scholar for the year.

In both provinces are institutions aiming at higher instruction than can be furnished at the schools mentioned. Principal among these is that originally known as the Royal Grammar School, but more recently as the College of Upper Canada. This institution is at Toronto. In Lower Canada are found a number of schools classed as academies and colleges, and both classical and industrial in character.

UNITED STATES OF AMERICA.

From the earliest settlement of this country by those brave men and women who landed on the rocks of Massachusetts Bay, no less imbued with the spirit of freedom and popular education than the love of God and liberty of conscience, the cause of education has been one of primary interest to both colonial and federal governments. A history of the sacrifices and toils by which were established and maintained the school-houses of the ante-revolutionary times of the colonial period, and a summing up of the truly munificent contributions of the federal and State authorities since the adoption of the constitutional government, to the great end of creating a citizenship worthy of our free institutions, are sufficient to awaken the ambition and enthusiasm of the dullest soul.

And yet, properly speaking, there is no American system of public instruction. Left, as it is, to the States, each in its sovereign capacity, to devise and execute such provisions for the education of the people as may be deemed expedient, the diversity of plans is great. The details of these numerous plans are not regarded as appropriate to this report. Only the features characterizing the school systems of the States, as a whole, and an approximate statement of the funds set apart and appropriated for school purposes, can here be given. More than this is not really needed for the purpose of making a general comparison of our educational condition with that of other nations.

Again, even if it were desirable, and if time and space were equal to the work, it would be impossible to furnish as late and as accurate statistics as are found in most European countries, since in this, as in other information and statistics relating to our material and social prosperity, there are no such provisions made for ascertaining, from year to year, our actual status as are made in the countries of the Old World.

The public school systems of the several States have the following fundamental provisions: The acceptance of such grants of land as have been made by the general government for school purposes, and the investment of funds arising from sales of the same, together with those accruing from State and individual endowments, to the establishment of

schools for public instruction. The supervision of these schools by a superintendent, whose office has the dignity of a department of the State, and whose official authority is final in all matters pertaining to the apportionment and disbursement of public moneys for, and in whatever relates to the harmony and general interest of the local administration of the schools, under the constitutional provisions of the State. The supplementing of such income as may arise from endowments on deposit by a local tax, and by the annual appropriations from the State treasury of such sums as may be demanded by the school interest of any given year.

These provisions are substantially the same in all the northern and in some of the southern States; while in districting the State for school establishments, selecting sites, and erecting school buildings, certificating and employing teachers, supervising the local administration, &c., there is a great diversity of plan, and every result but the best, arising chiefly from the independence of small districts and intrusting neighborhood interests to incompetent or inadequately compensated persons.

The actual amount, in value, of the endowment fund of the entire Union cannot now be estimated, since it is yearly increasing from the sale of lands and better investment of proceeds. It was aggregated some ten years since, and it then reached the value of not less than $50,000,000, and it must eventually far exceed that sum. In some of the individual States it has already amounted to millions, varying from two to ten, the annual expenditures of whose schools from endowments, taxes, and appropriations are also counted by millions; that of New York, in 1866, being over $7,000,000.

All in all, the original provisions of the government for the education of the people are more liberal than those of any other; and in connection with the additions arising from regular taxation, and from appropriations made by the States themselves, present the most magnificent financial school basis of the world. The pride with which the American citizen regards this support of common school instruction is amplified by contemplating the scarcely less abundant endowment by which individual wealth has built up the higher grades noticed under the head of secondary education.

And yet, in that which relates to the elementary education of the whole people, our people are very far from being instructed. The school returns of 1860 and 1861, the latest that are, as a whole, available, with an expenditure of nearly $25,000,000 for primary schools, show that scarcely more than one-half of the children of school age were in the schools. It must be taken into account, however, that the school ages of our States embrace a longer period than those of European countries, averaging from five to twenty years. Nor should it be forgotten that the estimates of the past, and including the dates named, were made upon the basis of a free white population. Since that date, the colored children of the South have been placed at school by hundreds of thou-

sands, and great advance has been made in improving and diffusing elementary education for all classes of that portion of the Union.

As apportioned for the years of 1860 and 1861, the 5,000,000, and somewhat more, of children in attendance upon the public common schools was one in five and a half for the entire white population; the distributions of which, in the great sections north and south, were one in four for the first, and one in fourteen for the last named, the division of the expense of the whole being proportionally greater.

Without making further comparisons between the States whose school provisions and school results widely differ, either as independent States or as sections of the country, it ought not to be omitted that there is room and urgent call for great improvement in whatever has to do with our common school interests. It is a fact worthy the consideration of all, and the consideration of which becomes the sacred duty of our legislators, that while many foreign governments are reducing crime and ignorance by a much smaller relative outlay of money, we are annually adding to our school funds without a corresponding diminution of either. It is is the language of the national Commissioner of Education, that "with all our State, municipal, and voluntary efforts for education, there is an immense amount of absolute illiteracy, and of corrupting influences arising therefrom; and that a diminution of this illiteracy, vice, and crime has not kept pace with our increased means of education." This is the language of the statistics of State and municipality on the needed increase of accommodations for juvenile offenders and of the appropriations made for their restraint and improvement; and, more potent than all, it is coming to be the language of the street-corners and alleys, not of our great cities alone, but of our towns and villages, wherever the guardians of the school population have not the natural appreciation of the value of school instruction, nor the public justice to require a regular school attendance.

If a multiplication of words could be of any advantage, there is room for any length of discussion and suggestion in regard to the improvement of this great interest. But the aggregated wisdom of such as have investigated, observed, argued, and presented every phase of this subject during the last fifty years, would furnish a respectable library of educational statistics and comparative values of educational schemes.

EDUCATION OF THE FREEDMEN.

Although somewhat beyond the scope allowed to this report, I cannot close this sketch of general education in the United States without reference to the efforts now so widely made for the education of the freedmen. This great and rapidly expanding work has been organized and finds expression through the Freedmen's Bureau, established in Washington in March, 1865, and placed under the direction of General Oliver O. Howard. A series of eight semi-annual reports on "The Schools for Freedmen" has been published, dating from January 1, 1866, to July 1,

1869, in which a detailed history of the school work in each State will be found. A very interesting review of the operations of the bureau has already been published[1] by Mr. Sidney Andrews, and I avail myself of two instructive tables which he has compiled from the above-mentioned reports, and which show most eloquently the progress and importance of the work.

Table showing the number of freedmen's schools, teachers, and pupils.

Date.	DAY AND NIGHT SCHOOLS.			SUNDAY SCHOOLS.		
	Schools.	Teachers.	Pupils.	Schools.	Teachers.	Pupils.
January 1, 1866	740	1,314	90,589	.....	.....	.....
July 1, 1866	975	1,405	90,778	.....	.....	.....
January 1, 1867	1,399	1,658	99,513	782	850	70,610
July 1, 1867	1,839	2,087	111,442	1,126	1,808	80,647
January 1, 1868	1,914	2,202	102,070	1,170	4,290	87,447
July 1, 1868	2,681	2,787	123,644	1,345	5,857	118,170
January 1, 1869	1,979	2,266	106,977	1,306	5,573	84,965
July 1, 1869	2,912	3,357	149,244	1,512	6,146	107,109

Of the pupils at the date of the last report all but 6,746 were slaves at the opening of the rebellion. In 1867 the freedmen paid $150,000 for tuition and $60,000 for school buildings; in 1868 they paid $175,000 for tuition; and in 1869 the account will reach about $200,000 for tuition and $125,000 for buildings.

NORMAL SCHOOLS FOR FREEDMEN.

The sixth semi-annual report upon schools for freedmen contains short notices of some of the principal normal schools. It is stated that but few of these institutions as yet approach the true idea of such an institution, but they are well designed and the plans for most of them are excellent and thorough. They will, as soon as possible, supply teachers for the freedmen from their own race. Among those cited are: The Howard University at Washington; the Fisk School, Nashville, Tennessee; Berea College; Biddle Memorial Institute; High School, Quindaro, Kansas; Lincoln University, Oxford, Pennsylvania; Avery College, Alleghany City, Pennsylvania; and the Hampton Normal and Agricultural Institute, Virginia.

The Howard University, Washington, D. C., was incorporated by Congress March 2, 1867, and is designed to afford special opportunities for a higher education to the freedmen. The trustees purchased one hundred and fifty acres of land in a very favorable location near the city, and by selling about two-thirds of it for building lots, secured, with a little additional help, the means of payment for the

[1] In "Old and New," while this report was passing through the press, February, 1870.

whole. By the aid of the educational funds of the Freedmen's Bureau two large buildings have been erected, one for recitation rooms, philosophical chamber, laboratory, library, offices, and chapel, and the other for dormitories and a boarding-hall. It is the design of the trustees to build up at the nation's capital a large and efficient institution, amply sufficient for supplying the demand of this new era and to give intelligent youth, whatever may have been their previous condition, the benefits of a thorough collegiate and professional education.

The Hampton Normal and Agricultural Institute was opened under the auspices of the American Missionary Association in April, 1868. It was incorporated in the following September, "for the purpose of preparing the youths of the South, without distinction of color, for the work of organizing and instructing schools." The location is a very suitable one, and the institute appears to be peculiarly well adapted for the work, and is conducted on wise principles. It was commenced and is energetically managed by General Samuel C. Armstrong.

POPULAR EDUCATION.

CHAPTER III.

PRIMARY EDUCATION.

General agencies of primary education—School buildings at the Exposition—General disregard of proper ventilation—The school-house from the United States—School buildings of Switzerland—Necessity for improvement in our school architecture—Prussia, outline of branches taught in a primary school—Comparison with the primary school instruction in the United States—Supplementary agencies of primary education—Lectures, lyceums, libraries—Schools for the destitute and vicious—Schools for the idiotic.

There is a sense in which the term "popular" embraces the entire range of the education of a people; but the intention is to restrict it here to the more usually accepted idea of "common-school education."

I.—GENERAL AGENCIES.

In no one respect is there, for the nations attempting a systematic diffusion of its blessings, so radical a defect as in the character of the buildings provided for primary schools. Details on this subject are not within the range of this writing; but the vast educational interests involved forbid the omission of such references as may direct the attention of both patrons and government to the existing defects and their remedies.

SCHOOL BUILDINGS.

After an examination of the school buildings on exhibition at the Exposition, the observations in many lands, and the collation of numerous reports on school interests, it is respectfully submitted that the buildings of this class do most lamentably fail of their proposed end.

Just here both pleasure and duty call for a reference to the exhibits of school buildings at the Exposition, (a special report on which, and on kindred subjects, was assigned to another Commissioner,) for the purpose of noticing the enterprise and success with which the State of Illinois furnished a school-house which, in all respects of adaptation to school purposes, was not only superior to other exhibits of its kind, particularly in respect of neatness and means of lighting and ventilating, but to the average of those I have found in any European country. It is also to be noted that the commissioners, through whose agency it was provided, did not aim to present a school-house peculiar to their State, nor yet the

ideal one of an American educator, but a real one, such as might serve to show the average (this one a little superior) of those in actual use as the "cross-roads" and "country school-house" of the northern and western States.

But even this school-house was seriously faulty, in that it did not properly provide for ventilation, though in this respect superior to those from Prussia, Saxony, and Sweden, providing not at all—its three large windows opening both from the top and the bottom; while in the others the windows, besides being inadequate to lighting, had upper sashes that were immovable. Still, every one who understands the physiology, so to speak, of ventilation, as well as its chemistry and mechanics, knows that in winter this mode of purifying the vitiated air of an apartment, while it effects the intended object, can do so only at the peril of some of the occupants.

It would add but a trifle to the cost of a school building to ventilate by flues, so constructed as to be managed at pleasure, and to give to each pupil, without the calamity of cold-taking inseparable from window ventilation, a constant supply of fresh, pure air, which would be of incalculable economic value to the soul and body of a school population.

While it would have been unfair to place on exhibition a building quite superior to its kind, when assuming to give an opportunity of comparing the actual status of the American school-house with those of other nations, it is none the less deplorable, and none the less disgraceful to our own than to other countries, that the importance of thorough ventilation should have so little practical recognition. We know that each child needs at least eighty cubic feet of air for the processes of a healthy respiration. Where, among the volumes of school enactments and regulations, are to be found the requirements of law to this end? While many are ample in providing the requisite number of schools, and not a few are taking measures to see that the teacher is not overtasked in the number of pupils in his individual care, the child for whom these provisions are primarily made is confined to such space as his elbows may secure, and his lungs limited to a scanty and vitiated share of the air provided for a defrauded set of school-fellows. As far as school statutes show the action of government in this regard, England alone, while so far behind in most of its common-school provisions, enacts that the aid granted to a school is to be withheld, "if the school is not taught in a building certified by the inspector to be healthy, properly lighted, drained, and ventilated, and containing, in the principal schoolroom, at least eighty cubic feet of internal space for each child in average attendance."

These vital physical conditions having been met, there remain the desiderata of agreeability and pleasurable emotions to be considered; and no school-house is thoroughly adapted to its purposes whose appearance does not inspire emotions of real pleasure in its attendants.

LOCATION OF SCHOOL BUILDINGS.

The only commendatory words, from a host of school reports, in regard to both the structure and location of primary schools, and which are confirmed by personal observation, are in the honor of Switzerland, by the French school commissioner, M. Baudouin, who says: "The smallest village has its school-house, the greater number of which are pretty, spacious, well lighted, and pleasantly situated."

From an American report I extract the following criticism, which, while it is too severe for most, is yet so literal a representation of the facts of a large portion of the rural districts, where such a state of things is least excusable, that it ought not to be omitted: "Thousands of children are sent daily out of heated and otherwise wretchedly uncomfortable school-rooms into play-grounds where there is nothing but a parched earth and a blistering sky. From that one whose treeless, shrubless yard contains only the building upon which have poured the red heats of the ascending day or clouds of roadside dust there will hurry an impatient crowd, every individual movement of which says, plainly enough, 'Anywhere but here!' These are the half-baked, irritated little irresponsibles who go forth to vent the bad blood of our bad philosophy of education upon whatever comes in their way. On the other hand, those who go out from the embowering shade of trees into grounds beautiful with vine and shrub and flower, pass as naturally into the enjoyment of rational pastimes as the birds to their carols amid the summer boughs."

The United States are annually expending immense sums of money—amounts that can only be enumerated by millions—in the enlargement of old and the construction of new school buildings, not one in one thousand of which, in either structure or surroundings, has regard to the principles involved in the material conditions necessary to the physical, moral, and intellectual health of the children. There is no reason that we should not, but every reason that we should, begin the inauguration of a school architecture worthy of our prosperity as a people, and worthy of the estimation in which our institutions hold the children who are to become the sovereigns of this great commonwealth.

PRUSSIA.

In the general survey of education in Chapter II a general exhibit of the courses of study in various countries, shown by their schemes of primary education, has been made; but, for special reasons, some differences in these courses and in the methods of imparting instruction will now be noticed. Since the field is so large, these notices will be chiefly confined to Prussia, where, for the expenditure of time and means, is secured the most, and to the United States, where is secured the least, of that which is the aim of all—educational result.

The following outline of branches taught in the eight years' course of a primary school is divided into four parts of two years each:

Part first, including children from six to eight years of age, embraces four principal branches—

1. Logical exercises, or oral exercises of the powers of observation and expression, with religious instruction and the singing of hymns. 2. Elements of reading. 3. Elements of writing. 4. Elements of numbers.

Part second, with children from eight to ten years of age, seven principal branches—

1. Exercises in reading. 2. Exercises in writing. 3. Religious and moral instruction, in select Bible narratives. 4. Language, or grammar. 5. Numbers, or arithmetic. 6. Ideas of space and form, or geometry. 7. Singing by note, or elements of music.

Part third, with children from ten to twelve years of age, eight principal branches—

1. Exercises in reading and elocution. 2. Exercises in ornamental writing, preparatory to drawing. 3. Religious instruction in connected Bible history. 4. Language, or grammar, with parsing. 5. Real instruction, or knowledge of nature, including elements of the sciences and arts of life, of geography, and history. 6. Arithmetic, through fractions and rules of proportion. 7. Geometry—doctrine of magnitudes and measures. 8. Singing, and science of vocal and instrumental music.

Part fourth, with children from twelve to fourteen years of age, six principal branches—

1. Instruction in the religious observation of nature; life of Christ; history of the Christian religion, in connection with contemporary civil history; doctrines of Christianity. 2. Knowledge of the world and of mankind, including civil society, elements of law, agriculture, mechanic arts, manufactures, &c. 3. Language, and exercises in composition. 4. Application of arithmetic and mathematics to the business of life, including surveying and civil engineering. 5. Elements of drawing. 6. Exercises in singing, and the science of music.

The independence of the several States of the Union, as of each municipality in the separate States, renders it impossible to furnish, since it does not exist, a uniform grade of studies pursued in any class of schools; but the following outline of the range and extent of instruction furnished in one of our eastern cities will give a fair showing of the primary course found in many of our cities and larger towns. School age also being optional, an average is taken as approximating to the facts of the case.

First year, with children from six to seven years of age: Reading and spelling; reading numbers to 100; adding and subtracting with small numbers, by use of objects and the numeral frame; drawing small letters, capitals, and the Arabic numerals on slate; daily exercises in enunciation; oral lessons on form, size, color, illustrated by objects in the room, and the same on familiar plants and animals; repeating verses and maxims; singing and physical exercises.

Second year, with children from seven to eight years of age: Reading and spelling; punctuation marks from cards; notation to 1,000; multi-

plication and division as far as 144; oral instruction in the most common phenomena of nature, and the elements of geography; maxims and verses; singing and physical exercises.

Third year, with children from eight to nine years of age: Reading and spelling, with instruction on punctuation and the use of capitals; rules and small examples in arithmetic, through the simple rules and their combinations; geography, through the United States; Roman notation completed, with exercises, in both print and script, on slate; oral lessons from nature, also on objects and occupations, with comparison and classification; verses and maxims; singing and physical exercises.

Fourth year, with children from nine to ten years of age: Reading and spelling; primary geography and arithmetic finished; grammar and United States history commenced; writing.

Fifth year, with children from ten to eleven years of age: Reading and spelling; intermediate geography; arithmetic, through reduction, with applications of past rules to practical questions; grammar and history advanced; writing and composition.

Sixth year, with children from eleven to twelve years of age: Reading and spelling; intermediate geography and United States history completed; arithmetic through fractions and compound numbers, with miscellaneous practical examples; general history commenced; grammar, to syntax, with writing and composition.

Seventh year, with children from twelve to thirteen years of age: Reading and spelling; geography reviewed; arithmetic through percentage, ratio, proportion, and alligation, with general review; history advanced; grammar finished; writing, book-keeping, composition.

An estimate of the comparative value of these courses of study must have regard to both methods and universality, no less than to the branches themselves. In the branches taught, the course prescribed for the Prussian school is quite in advance of ours, particularly as regards drawing, music, adaptation of instruction given to a knowledge of nature and the arts of life, and religion.

To the early practice of drawing familiar objects is to be attributed the very noticeable excellence of the penmanship of their youths, and of the adult peasantry of the country. To the continual advance of this art may be traced the development of the great mechanical and manufacturing genius of the people, and with no special reference thereto or loss of school time, as it is the experience of their teachers that drawing, as practiced from first to last in their primary schools, may be made incidental to the furtherance of almost all other studies.

The direct effort made to render the instruction given subservient to the common end, knowledge of nature and the arts of life, is two-fold in its object—the first being in the interest of scientific and mechanical uses for the business of life, and the second, a never-lost-sight-of aim,

to inculcate ideas of the beauty and utility of nature with the principles of morality and religion.

The music with which the Prussian course of study is so interspersed needs no commendatory word, any more than does that practice of physical exercises for which provisions are so generally made. So long as the body and the mind have co-ordinate powers in the development of the individual, it is wisdom to recognize and folly to ignore the means by which the best conditions of each may be reached. In these foreign schools both music and gymnastics rise to the dignity of branches taught during the years of primary instruction, since one is specifically named for the school-room, and, by a practice that has come to have the authority of a precedent, the teacher so takes part in the pastimes of the pupils that he is enabled to attract them to the best methods of exercise.

The extent to which the instruction, as indicated, is given is measured by the extent to which the school law of the kingdom furnishes instruction at all, since it is not left to parish, hamlet, or city to decide what shall be the course of study for its primary schools—the law prescribing and enforcing the same for all. Thus, whatever advantages may be derived from a rudimental education in those branches of human knowledge which generations of the world's ablest educators have deemed essential to any of the various classes of society are here provided for the most obscure of its peasantry.

PRIMARY SCHOOL INSTRUCTION IN THE UNITED STATES.

The methods by which courses of instruction are severally made available to pupils are very different; but to give an adequate idea of the methods through which not only Prussia but other of the continental countries have managed to incorporate the information and the discipline of study into the great body of school children would be impossible in an account not illustrated by numerous examples. These methods are the result of a careful investigation of the philosophy of the human mind, in connection with such material aids as will most naturally facilitate a prompt and healthy response to efforts for its development. According to the decisions of that investigation, methods of imparting instruction have been defined, appliances furnished, teachers qualified, and attendance demanded with a unity and inflexibility of purpose for which the history of education finds no parallel.

In our country no courses have been prescribed, no methods defined, no appliances furnished, no teachers qualified, and no attendance demanded, as referring to any unity of action or standard in any of these particulars. As a consequence, while the theory and practice of one system work to the same end the theory and practice of the other are at variance.

Perhaps the distance between the methods of instruction found in the two countries may be made to appear more clearly in the light of the two simple propositions that are fundamental to all theories of educa-

tion—that acquisition should not go beyond discipline; that study should not be allowed to weary. These propositions are not only respected in the Prussian school scheme, and instructors prepared with direct reference to them, but the utmost care of the government is directed to the end of both, that the results may be true to the propositions. The philosophy of the American idea is equally high and truly based, but we have no machinery for bringing about the results.

A Prussian child is not permitted to use the language of an idea he does not make his own. Spelling long columns of words, and reading pages of words such as could not be intelligently made available in conversations with teacher and school-fellow, are not allowed; and the same principle is carried through the instructions of the first to the last day of its eight years' drill. And yet, by that intimate and constant habit of conversation between pupil and teacher upon the many topics of school study, and the endless correlations of kindred and suggested subjects which it is a part of the teacher's preparation for his work to know how to bring in, the children of these schools, at a very early age, come to have a use of language far beyond the range of their studies. I say *use* rather than knowledge of language, for the purpose of calling attention to the difference in the educational value of these words. Nothing is more common than for one of our school children to call out so much of a sentence as barely gives the answer to a question. A Prussian teacher does not accept, to such as ask the color of the child's dog or the father's house, "black," "wood," but requires of the youngest pupil an expression of the sentence in which these words would occur as correctly as if made by the teacher himself, helping the new beginner in the art of conversation by requiring those more advanced to give the same answer in various correct forms of speech.

The packing process of our aim, to get the largest possible amount of information in the smallest possible time, defeats itself, in that it gives so little opportunity to assimilate and apply, without which the mass of mere information slips from the memory or remains a clog to the natural action of any special faculty.

The more universal use of instructional appliances in these schools is greatly in contrast with our use of text-books. Contrast the hours of study which our children devote to pages on pages of unillustrated theories—to days and weeks of recitations unillumined by conversations—to treasures of acquisition unapplied to life, with those theories that are illustrated by every device of mechanical genius—those recitations that are made brilliant by the reproduction of times and actors—those acquisitions that are applied to every interest and use of life, and you have before you a sample of the district school of America and the parish school of Prussia. The lessons are short and so varied with oral instructions and illustrative mechanism that weariness is seldom induced; so that the recreations of play-ground and work-shop, of gar-

dens and music, are not so much a refuge from the tasks of the schoolroom as a part of the instructional scheme.

It is with great reluctance that the superiority of provisions for securing so high a grade of primary education has been accorded to a foreign rather than a home administration, nor am I willing to admit that courses as complete and methods equally good are not found in some of our city primary schools; still, so far as positive knowledge goes, it cannot be affirmed, while the average of both will compare unfavorably with those of many other countries. The course of study, alone, for the time required, is in favor of the foreign methods of teaching. Making the facts of attendance equal for both, with our methods of teaching, I do not believe it could be accomplished in the given time. This is said after a consideration of the difference in the homes from which the children of the two countries come, and the conceded unusual sprightliness and versatility of the "young American" intellect. But we give no such attention to the physical training of our youth as is there given. With anything like such care as many European nations bestow upon this there is no doubt that the physique of our children would respond to an ideal of great superiority.

If it is with reluctance that a comparison is here made between the courses of study and the methods of teaching distinctive of our own and some other countries, it is with still greater hesitation that the subject of teachers, for primary schools, is approached.

To the provision of competent instructors may be traced the excellence of whatever schools are excellent, of whatever grade they may be, and wherever found. To the failure of such provision may be traced the inferiority of whatever schools are inferior, of whatever grade they may be, and wherever found. If the results of acquirement and discipline found in the best educated nations of the world could not be accomplished here, in the given time, with our methods and uncertain attendance, neither could it be here, with their methods and regular attendance, and our teachers. Economically considered, the expense of furnishing first-class teachers to schools otherwise poorly equipped is small as compared with that of schools in other respects well provided, but falling into the hands of incompetent instructors; since the one may to a considerable extent supplement every other lack, while the other will assuredly pervert what he does not know how to use. If, in one sentence, I were required to give what I believe to be the most valuable discovery of the educational world up to this present, it would be, that "poor teachers are worse than no teachers."

Such conclusions according with experience and observation, it becomes our duty to inquire into the means of securing the best teachers for that class of schools which begin the work of education. This inquiry leads to an examination of the results obtained by foreign nations who are reaping the fruits of efforts we are just beginning to feel the importance of making.

The first movement of the German states for preparing teachers to carry out their ideas of popular education, was directly in the interest of that primary instruction it was the policy of these states to make available to, and accepted of, all classes of their people. The foresight that decided upon the qualifications of teachers for this grade of schools is justified by the results to every other—the office of teacher, from the highest to the lowest, having become professional, permanent, remunerative, and respectable. The machinery put into operation to secure these ends, and the care extended to its working, is truly wonderful, considering the time of its inauguration; and more particularly by Prussia, so impoverished and humiliated by the French imperial arms of 1806, which was about the time when the government began to move most actively in advancing all its school interests.

To make it professional, and to give it high tone as such, in addition to the acquirements demanded of those who aspired to the office of teacher, tests were adopted to ascertain the natural aptitudes of candidates for this profession, without which the widest range of scholarship may be comparatively valueless; and it is the practice to discourage all such persons as are tempted to teach as a resource, after failing in other pursuits. After having been accepted as candidates for normal training, each student was required to verify, from time to time during the entire course of several years, his practical ability to make instructions given available to the uses intended, any failure to do which usually put an end to further preparation for an office the individual was not likely to fill acceptably. When graduated from the instructions of the most accomplished teachers of the kingdom, a yet further test of one year as the assistant of an accredited master was necessary to the coveted position; and a failure in any particular here insured the profession riddance of so much incompetency, since no attempt to make up for such failure was ever permitted in a state institution, and no such person was admitted to the staff of public school instructors. Nor ought it to be omitted that any discreditable conduct, any discoverable tendency to moral delinquencies, anything but the tone and practice of a Christian gentleman, was, in itself, a disqualification for preparation or practice in this art of all arts, so cherished and environed by the combined watchfulness of state and church and people. Surely and slowly this trio of powers have co-operated, from that to this time, to raise the standards and improve the methods of qualifying teachers, to the end that the primary instruction of advancing years might keep pace with the growth of national prosperity and the demands of civilization.

To insure all possible permanency to the practice of the chosen pursuit, students in normal institutes were required to register their affirmations of intention to prepare for teaching, as a permanent business, before a dollar of money or an hour of time could be expended in their instruction. Even before the period when age admitted to such opportunities, the recognized code of both interest and honor made it cus-

tomary that the earliest development of preference for this vocation should be made known to the village pastor and the village teacher, to the end that natural fitness for it might be fostered through the years of rudimental study, and the religious character divested, so far as pastoral watchfulness could assist it, of everything that did not savor of Christian virtue, thus strengthening the idea of a permanent position in manhood with the pride of the village and the aspiration of the boy.

When all was done and every test was satisfied, the installation of a teacher into the sacred duties of his office was made the occasion of a civil and religious ceremonial, in which the honor conferred was bound to be the honor of a life-long and beloved profession. Of course the wisdom of the authorities that could take such an interest so scrupulously to its guardianship could also, as it did, provide for the contingencies of a withdrawal from the service when the best good of either the individual or the public demanded it; and so happily have the two been combined that, practically, the government has suffered little loss in out-fitting those whom the fortuities of life have turned from the practice of instructors.

So far, the establishment of this profession has been secured. It must, also, be made remunerative. To this end, a minimum compensation was arranged which has kept a steady advance with the standards of excellence required, and been so supplemented by provisions for accident, sickness, old age, and, finally, for the family left behind when death calls the servant away, that, while the public school-teacher may not often cherish the ambition of living or dying rich, he is placed beyond the possibility of want in anything relating to a comfortable living, both for himself and those dependent upon him. The actual amount of this compensation is determined by the expense of the times and the locality of residence, often a better security than a larger definite sum not considering these circumstances. For this compensation the government is directly responsible, as it ought to be, for the pecuniary support of those it has prepared for so important a branch of the public service; whose authority installs into and out of that service as the public good demands; and whose aim is to so dignify the officials of these positions that they may serve as the immediate links by which the individuals and communities of the entire national domain may be held in grateful allegiance to a furtherance of the national prosperity and power.

Such is the system of Prussia, and, with slight modification, of other of the German and Scandinavian states, for qualifying, retaining, and dignifying the teachers of their primary schools; and such, or something still more efficient, the system I hope to see established in our own country. Interest in normal instruction is being quite generally awakened, and in many of the States of the American Union schools for the training of those who expect to teach are springing up; while institutes for conference and comparison of views are frequently

held in the localities where teachers can conveniently come together, where from days to a week are spent under the direction of the State superintendent of instruction, assisted by such educators and friends of the cause as can be improvised into this service. Great good is thus being done; but mainly, yet, in calling attention to this long-neglected interest, the results of which scarcely touch the actual state of public-school instruction.

It cannot be said that we are without teachers in our elementary schools, whose natural nobleness and Christian character—whose knowledge, discipline, and devotion to their calling, eminently fit them for the posts they fill; but it must also be said that such are so rare as not to form a class to be spoken of. The almost universal habit of placing the children of our country districts under the school management of quite young persons of either sex, particularly if at the hastily-passed-over examinations they have given some pertinent and "smart" answers, and can be had cheap, is most execrable. Placing children in their most plastic conditions of soul and body, with every nerve and sense and faculty keenly alive to impressions, under the tuition of mere children themselves—so far as fitness for this duty comes of experience and matured observation—merely because these persons can follow the questions and answers of text-books, is a crime against the age which sees it, and a crime against the child who is the subject of it, in comparison to which allowing the child to grow up unlettered is excusable. There is no crusade that could be inaugurated on behalf of childhood and its rights so holy as a combination against such practices. Better, a thousand-fold better, send out this army of innocents—children whose early years are not merely defrauded of their most sacred rights, but perverted to irremediable results—to spend their school days amid the novelties and interesting objects of nature; and while they at least invigorate their bodies, let the empty school houses of the land bear the inscription, "Poor teachers worse than no teachers."

Even when you find persons of more mature age in charge of these schools, how much better is it? Instruction may be given in the desired branches; an external discipline of order may be maintained; an educational result of mere intellectual value may be secured; but, as a rule, the sum total of value to the child will be less. And why? This may best be answered by the inquiry, Why is the teacher there? Certainly not because the position is coveted as a choice of pursuits—because the flock is beloved, and each member of it a study to his lively and interested observation—because by the intention of making each year more valuable to them, is cherished the hope of seeing one by one go out with character and acquirement to honor whatever position life may offer. Far enough from all this. I speak of the average when I say that our primary-school teachers are where they are because of the failure to secure something better to do; or as a make-shift, while waiting for something in prospect. As a refuge from disappointed ambitions,

or as a stepping-stone to a position for which he needs a little time and temporary support, this occupation must be, in all vital particulars, less ably filled by those who have years over their heads than by such as are, at the least, nearer the needs of the young in their freshness of feeling and unformed plans.

And who is to blame for such a state of things? The authorities of State, municipality, and home. By the failure of any one of these, and of any combination of these, to define a standard by which qualifications may be tested, to furnish a support by which it may be made remunerative, to create a public estimate of valuation, by which it may be made desirable, the office of primary-school teacher has been left to what it is found to be.

I am half ashamed to do so, but will quote the words which more than twenty-five years ago that noble philanthropist in the cause of education, Horace Mann, reported as his estimate of the general status of the primary-school teacher of Prussia. He says: "In the lowest school of the smallest parish, in the obscurest village, and for the poorest class in overcrowded cities; in the schools connected with pauper establishments, with houses of correction, or with prisons—in all of these, there was a teacher of *mature age*, of simple, unaffected, and decorous manners; benevolent in his expression, kind and genial in his intercourse with the young, and of such attainments and resources as qualified him not only to lay down the abstract principles of the above range of studies, but, by familiar illustration and apposite example, to commend them to the attention of the children." The years between that and this time have been years of vast enlargement and improvement in all that relates to the educated growth of that people, and the observations and reports of to-day are glowing with appreciation of the value and honor of the teacher of their youths.

It is important enough to bear repetition—the hope that something as good as this may be done for the primary instruction of our country. There is no reason why something better should not be done, under our more flexible and generous government, and our institutions whose theories are the envy of the world. Qualifications cannot go too far. The broader and higher the range of culture and discipline the teacher has reached, provided the moral development has been healthy and happy, the more easily is accomplished the work of coming down to and aiding upward the whole being of a little child. In this work the early teacher stands next to the parent; and without these intermediates, of value corresponding to its capabilities, it is utterly vain to look for that quality of worth and usefulness in the after life, else so easy of attainment.

One thing is certain: whatever the standard for qualifying the teacher of our children may be, no standard, however high, for the remuneration and honoring of this office established by other nations will do here. To hold the American teacher to the work of instructing children, a com-

pensation and a credit that will compare favorably with the opportunities that a high order of talent and culture may find in other callings must be established or they can never be secured to this service. Again, a high order of native talent, a liberal culture, a generous remuneration, and an honor equal to the ambitions of the restless, intense, and aspiring character of our young people must be secured, before our children can be brought to properly honor the authority and value the instruction of their elementary school teachers. There is no mistake about it. There is a relation between these things established by mere children, long before we see the danger we cannot then avert, and which influences, as a wise parent would not choose to have it influence, all after development.

II.—SUPPLEMENTARY AGENCIES.

Even in those countries where educational provisions are universal and the reception of instruction is compulsory, education is not the universal result; while in countries where they are partial, and reception optional, the results vary in every degree.

For the naturally endowed, but destitute, supplementary agencies find a very general expression in Sunday schools where, in addition to moral and religious instruction the rudiments of common school knowledge are imparted. Such agencies are always found in factory and apprentice schools that undertake to make up a portion, at least, of that primary education of which early and regular occupation would defraud its subject. They are found in many of those regimental schools where public justice or private philanthropy undertakes to diminish the adult ignorance that has been called upon to defend or enlarge its country's borders without possessing so much as the alphabet of its country's knowledge.

Evening schools are an important feature in the supplementary education of all people who are in earnest in enlarging their educational forces. They are established in towns and cities almost everywhere, and with their multiplication the numbers of each increase. The pride that kept many an ignorant man or woman from an attendance upon these schools by which public admission of ignorance was made, is giving way to the stronger desire of securing the better conditions of means and position. These schools defraud no one; it being conceded that the labor usually counted exhaustive is not so exhaustive, but that the incentives and opportunities of knowledge which in no way diminishes its present remuneration and promises an increase to more intelligent effort are equal to a stimulation of intellectual exertion. The fact that these schools have often to commence at the very bottom of the ground-work of instruction is, in one view, discouraging; but the encouragement of finding the fathers and mothers of children of school age ready to begin the neglected rudiments of their own education balances the prospect. Outside of a thorough and required instruction of the young, there is

no branch of supplementary schools that appears to me so valuable as these evening gatherings of grown-up people, the parents and friends of those children whose education is most likely to be neglected.

Lectures, lyceums, library associations, all hold a high place among the supplementary agencies of ordinary education. Much has been done, but much more remains to be done, to adapt these means of culture to the lowest standard of such as are seeking, through intelligence, a bettering of their condition. The lyceum, too, has its spread and its peculiar uses, and has been already largely introduced wherever a band of from a dozen to twenty persons have been associated together for the discussion of practical questions under the encouragement of a good and intelligent individual. These and related aids are economically suited to supplement the education of any neglected class, and are, to a larger extent than the school reports of many a nation would admit, needed. In our own country they have the recognition of popular sympathy and are somewhat available; but the opportunities are yet large for the combined labor of the authority and good-will of communities to establish such means as may, from these, develop to the great unsupplied want of education. Libraries of useful and attractive information are being founded in the interest of those whose cause all supplemental agencies plead, and for the class now considered—the naturally endowed, but destitute—furnish the most available means within the reach of every community and each individual. Books for the million, as soon as the million knew how to use books, was the call of those who led the warfare of intelligence against ignorance; and books, suited to every class and all capacities, are being piled higher as the worth of man and the uses of life are more recognized.

SCHOOLS FOR THE DESTITUTE AND VICIOUS.

For the naturally endowed, but vicious, both governments and people have always moved more promptly in the directions indicated than for those who, under great disadvantage, have maintained a genuine or a seeming obedience to the laws. This premium, so to speak, awarded to the vices over the needs of ignorance, has a quite remote history. But since it is not proposed to go into a history of preventive and reformatory education for the destitute or the vicious, but simply to call attention to the radical failures of any systems of public school instruction, as indicated by this large range of supplemental aids, preference will be given to those organizations which have served as models to succeeding ones.

In time, the labors of the great and good Pestalozzi for the vagabond and deserted children of Switzerland, in 1775, and of the Netherland Society of Beneficence in Holland, in 1818, preceded the establishment of the *Rauhen-Haus*, at Horn, near Hamburg, in 1833, by Wichern, and the *Colonie Agricole*, at Mettray, in France, in 1839, by Demetz. These latter institutions, having owed their peculiarities of excellence to the growing recognition of the times inaugurating them, in regard to the neces-

sity of more general elementary education not merely provided, but enforced upon the lower classes, very naturally took the ground that education, and not punishment, should characterize all reformatory provisions. They went further; maintaining and convincing by their unparalleled success, in the work of permanent reform, that moral elevation must be in advance of intellectual, at least for the classes they sought to bring in to their sheltering—the most depraved of all that could be found.

Accordingly the inmates of these establishments were divided into families of not more than twelve, each group being under the care of persons whose mission was to combine the discipline of a school and a home, as circumstances would admit. From that day to this, prisons for convicts of youthful age have mainly disappeared from the world, while prisons for adults have universally felt the amelioration of the truth there practically illustrated, that instruction, including labor and affection, not failing of discipline, were to join hands in securing society against crime and in giving back to society the truly reformed criminal. And yet reform schools, and prison schools, what a shadow they still remain upon the school records of almost all countries! In vain the sums of money annually appropriated to their support repeat, in the hearing of legislators, that it is easier to prevent than to reclaim a criminal, and vastly more economical. In vain, or almost, so slowly do fruits of these labors diminish the statistics of vice and ignorance, do the nations assemble in international fraternity to consult how best to convert the necessity of prisons into the opportunities of instruction. No later than in 1855 at Paris, and since that at Brussels, the statesmen and philanthropists of nearly all countries met in this common interest. There is no mistaking the work of the statesmen and the educators who would stand foremost in the history of immediate generations—that of wiping out supplemental and reformatory educational attempts, by devising such means of public instruction as will secure, what has never yet been secured, the education of all who are amenable to law. There is no glory of power and wealth, so considered, that could take from the brow of any people the crown that would accredit such an achievement as this.

For the partially endowed—the blind, the deaf, the dumb, the idiotic—does any one think to place these beyond the pale of a public responsibility, so evident in the cases of destitution and vice? No. The number of those who cherish the delusion that an inscrutable Providence has decreed numbers of innocent persons to a penalty for which there is none but divine accountability, is rapidly diminishing, as science, which has pioneered the way into the hidden treasures of the material world, is piercing with its light of established truths the dark mysteries of social disorder. Sentiment and theology may stand aside. The logic of statistics is showing how closely violation of law is followed by the results of deformity and deficiency; while the same unanswerable

tables, in connection with educational deficiency, tell the story of human wretchedness.

Education for these unfortunates has kept pace with enlightened civilization, and there are no Christian countries which do not supply some means of helping them to a better use of such powers as they have, as a supplement of those they have not. The annual appropriations made for institutions suited to the partial physical endowments of the blind, and of deaf-mutes, are hopeful premonitors of the time when individuals of these classes will be as rarely found as were of old instructions for their special improvement.

SCHOOLS FOR THE IDIOTIC.

The science and beneficence of the times are nowhere more noticeable than in recent efforts for the benefit of the idiotic. The results of educational attempts, for this most unfortunate class of all unfortunates, have already placed the improvement of the idiotic beyond the doubts of controversy; and nowhere else are the related physical and intellectual laws of the human constitution more amply illustrated. This last and most reluctantly entered field of investigation seems to approach, if not to reach, the limit of the operations of the educator.

Idiocy—that condition from which the world has turned with a repugnance that did not shrink from endowments however else partial, nor from the degradations of poverty and vice—the imbecility of which was so much more hopeless than the ravings of insanity—idiocy is at length to have the elevation of a limited yet possible education.

CHAPTER IV.

SECONDARY EDUCATION.

SCHOOLS OF LOWER GRADE—SCHOOLS IN THE GERMAN STATES—SCANDINAVIA—FRANCE, ENGLAND, AND THE UNITED STATES—SCHOOLS FOR A HIGHER GRADE OF SECONDARY INSTRUCTION—GYMNASIA—REAL SCHOOLS—SECONDARY EDUCATION IN ENGLAND—PRUSSIA, ITALY, FRANCE—UNITED STATES.

I.—LOWER GRADE.

Secondary education of some sort has always existed, and has had its place in or out of the plan denominated popular, just in proportion as the line, no less flexible and varying than its boundary, which defined the national idea of popular rights has been liberal or limited. As the truth that a certain amount of rudimental knowledge is essential to all alike took root in the convictions of thinking people all over the civilized world, and that all classes *must*, therefore, have it furnished to them, so, as the facts of this furnishing began to multiply and bring fruits, the still more distinctive truth that, beyond this essential education, all people did not need exactly the same advancing culture, and *might*, therefore, have that which their necessities or inclinations decided as best for them, began to illustrate itself in a class of schools hitherto unknown, and to give to secondary education the honor of verifying its practical value.

Up to this time it had been classical almost to the exclusion from its instruction of those who were not destined for the still higher advantages of superior culture.

The developments of science and ethics brought new ideas of value and duty; and these ideas were soon prolific of action that opened a field of education dotted all over with schools accessible to the mass and varied, almost, as the needs of the race. Anomalous as it may seem, this most remarkable of the educational phenomena of any time—and which has recently received such an impetus that it seems a spontaneity of our own times—had its first and still has its most complete illustration under those governments where the inherent rights of man are less distinctly admitted than in those where both the letter and the practice of the law are a unit in the advocacy of the largest freedom.

As in other great departments of instruction, there are in this gradations that rank as lower and higher, corresponding at once to the general ideas of the countries where they are fostered, and to the necessities of those who seek them.

GERMAN AND SCANDINAVIAN STATES.

Thus, in the German states, where this bifurcation of secondary instruction is most noticeable, the burgh school, which had long existed

as a municipal provision for the highest primary advantage, began at an early day to develop into the higher burgher and the pro-gymnasium; the first in the interest of practical, and the second of classical training, and yet with such a happy combination of each, that the students of neither were excluded from the advantages of the other. This principle seems to have kept pace with the spread of such schools: that while the pupil must have instruction in the direction of his anticipated calling, he should also be encouraged to secure so much of that which is considered culture as his circumstances made possible.

In the Scandinavian states the high, or grammar schools, the citizen's schools and schools of learning, altogether classical in their foundations, began to incorporate such special teachings relating to the business and arts of life as approximated the new demand, some time before the real schools of Denmark and the apologist schools of Sweden (both practical) began to define in distinct institutions the first grade of their two-fold secondary instruction. I have always regarded this necessity, which came of limited means and partial knowledge of how to give the new idea tangible form, as most happy, having prevented the divergence of these paths of special development to such extent as must have greatly lessened the value of each while tending to perpetuate that feeling of caste in society which it is one province of education to banish.

The ripeness of the time which saw the birth of this era in the education of the world is strikingly illustrated in the promptness with which both Russia and Italy began an appropriation of the light it brought to these so opposite civilizations. In the district school of that empire began the glimmer of the torch of science applied to the resources and capabilities of millions who could not hope, and who did not care, to find the old paths to better conditions; while in Italy, the soul of its departed greatness seemed to inspire the degenerated population with the thought that practical business education was the speediest road to the material power which must precede a recovery of the old prestige. To this end technical schools of number and variety equal to a stimulation of great national activity chronicled a very considerable advance in this grade of secondary education over that of most other countries. Switzerland is not behind in the supply of either classical or scientific secondary education; though the independence of the several cantons would make reference to any detail of differences tedious. In Belgium a very marked advantage to the people is dated from the establishment, in 1850, of intermediate schools of higher and lower grade, in each of which there is a section for instruction in courses leading to collegiate and to business life, which may be pursued together, or singly, at will. In truth, scarcely any of the most inconsiderable powers of Europe have not taken steps to secure to their people, the masses of whom have hitherto been either limited to primary or forced into exclusively classical instruction, the facilities of preparation, in some degree, for the varied occupations of practical life.

FRANCE, ENGLAND, UNITED STATES.

Three great names—France, England, and America—by their comparative inaction in this interest stand grouped together; not that they have left secondary education unprovided for, but that they have more slowly come to a recognition or a supply of its needs, as above indicated.

Though the people of the French empire have been for a third of the past century calling for a better and more popular middle class instruction, and though some considerable improvement has in both public and private ways been made, the educational forces of the government have been mainly directed to redeeming its low estate of primary, and ministering to the furtherance of its superior instruction. The communal college is yet the only public institution providing secondary education to the great mass of the people; and between this and the parish school there is a chasm that most of those entering upon ordinary labors and business pursuits do not know how to bridge. A real school of some sort, a citizen's school, a pro-collegiate course, coming down to the wants of those who may not go further, and more directly assisting those who, under difficulties, may, is still the great lack of their system of public instruction. An attempt has been made to meet this demand by incorporating courses of practical scientific value with the more classical curriculum of these colleges, and to give to these courses the desired grades by doing the same for the smaller number of royal colleges. Less than this has been done by England in connection with the burgh Latin and inferior grammar schools, which have yet kept up their classical front in lower, secondary grades.

How far the American high school, which, as a national institution, stands in the lower grade of secondary education, meets the requirements of our youths, so anxious to get ahead and so convinced that success in business is the measure of this, is a question that would be variously answered by educators. That they do meet this world-noticed popular move in the direction of encouraging and respecting special training, for special ends, in any way befitting the versatility of our genius, the magnitude of our undeveloped material wealth, and this epoch of our national history, I think few would affirm.

The Scandinavian states, the German, with most of the smaller European states, and Italy, have adopted courses of study for a more varied and thorough secondary instruction, giving to its lower grade a dignity and value which can only come of time and care not usually bestowed upon this beginning of the more individual training of the young. In the first intermediate schools of these countries will be found a fair illustration of the old axiom, "that worth doing at all is worth doing well;" and accordingly, whether providing for separate or combining instructions for the varied positions of life, the scholar is often reminded by the course and by the time required that a fitting for life has really commenced. The positive nature of the governments by which these schools are fostered, and of the people whom they educate, finds expression in

the reluctance with which things esteemed valuable in the more established schemes of instruction are let go for the sake of the new and importunate values of the present.

In contrast to these countries, England stands, for a great nation, quite alone in indifference to any popular claim, adhering to the exclusive classical character of its middle schools. Two reasons seem to justify this—the ancient endowment of many of these as grammar schools for the distinctly named purpose of preparing pupils for "ye universitie," and the result of a high classical tone of culture to such as belong to the best educated class. Many reasons, based upon both the justice and the policy of the case, could be brought to the other side, while the reports of the royal commission, of 1864, upon the condition of these grammar schools—originally founded for the classical training of poor and meritorious youths—are valuable in testimony favoring a remodeling of the entire system of them as grammar schools, and supplementing the demand they do not meet by such a middle-class school instruction as may begin to convert educated labor all over the kingdom to the account of national wealth and honor. Here, as in no other country in the world, secondary instruction of both grades has been, and up to this time remains, almost exclusively in the interest of that limited number who are to enter life with superior culture.

The lower grade of secondary education in France and in America is near together, not only in value but in the mode of reaching it. Endeavoring to avoid the example of their English neighbor on one hand, and without the cost and delay incident to adopting that of their German friends on the other, these countries have sought to secure such a beginning of secondary instruction as was indicated in the developments of recent years by additional courses in such schools as stand next to the higher primary. But these people, so little alike, and yet so much alike, in their impatience of delay, have measurably defeated these ends by crowding the communal college of the one and the high school of the other with studies beyond the time allowed. In this mistake France has rather the better of us, since there is a division of communal college labor and certificated credit such as our high schools have not provided. The youth who has been "put through" this school of ours, which is high in aim and often low in results, must go out with the credit or discredit of the whole gained or the whole lost, notwithstanding the fairest possibilities of future superiority that have been blighted by the excessive toils that won, or the mortifications of disappointed effort.

If the modern languages, mathematics, elements of design and drawing, of chemistry and physics, which make so much better front than formerly in these colleges and these high schools, could displace, a little, the older and more classical curricula of these schools; or, still better, if both together could gain time for a more extended good-fellowship, neither country would be so badly off while waiting for public need to

work out a scheme of secondary education that should combine the best of the old and the new ideas.

Thus, briefly, has been given a general statement of the status and prospects of lower secondary education for the countries where it is most distinctly provided as well as of the more recent features of its severance into paths leading to practical and professional life.

The whole subject opens up as of yet but partially recognized importance. As in the case of widely different interests, so, here, the finishing is virtually provided for if the base is well laid. The base, or first grade of secondary education in our country, is not well laid. It is not broad enough to embrace the daily needs of those who crowd its precincts without being led by its instructions in the directions that make the bread of labor sweet and respectable.

II.—HIGHER GRADE OF SECONDARY EDUCATION.

Advancing to higher intermediate education, the path is better provided and more defined. The Scandinavian states having commenced the improvement of incorporating physical studies with those of their grammar schools and schools of learning, have somewhat raised the standard of these while establishing a creditable grade of real and apologist schools in response to the popular call for both sides of secondary instruction. A still more noticeable advance has been made in Germany and neighboring states by the multiplication and increasing excellence of both practical and classical schools, until the real schools and gymnasia they foster, as a part of the recognized public-school system, cannot but be ranked foremost in what the world is to-day providing as the best of higher secondary instruction.

Modifications had been made in the course of studies for a gymnasium, at various times, tending to a recognition of that popular want the great German pulse has always been so quick to indicate. As early as 1812 the director of one of the most valuable of these institutions, in a publication connected therewith, says: "Though the gymnasium is a school for classics, and its instruction must tend to this object from the lowest to the highest class, yet consideration must be had, in the present condition of school matters, that those who intend to become tradesmen, mechanics, and artists, in the widest sense of these words, should be thoroughly prepared for such vocations." In 1831 the official language of the department of education announced that "it is a proposition void of all foundation, that instructions at gymnasia should be calculated for a course at universities only, and not in aid of the development of every mental faculty." The history of these times is full of interest, as illustrating that wonderful blending of the conservative and liberal qualities of the German character, and in no others more manifest than in things pertaining to the subject of popular education.

As now standing, and from authorizations as recent as from 1856 to 1860, the course of instruction at a gymnasium includes the following

branches, with their allotted time, during a period of nine years; the first three classes (beginning with the highest numbers) having one year each, and the last three two years each:

Instruction in the gymnasium.

Subjects.	Hours per week for each class.					
	VI.	V.	IV.	III.	II.	I.
Religion	3	3	2	2	2	2
German	2	2	2	2	2	3
Latin	10	10	10	10	10	8
Greek	.....	.....	6	6	6	6
French	.....	3	2	2	2	2
History and geography	2	2	3	3	3	3
Mathematics and arithmetic	4	3	3	3	4	4
Natural philosophy	.....	.....	.....	.....	1	2
Natural history	2	2	.....	2	.....	.....
Drawing	2	2	2	.....	.....	.....
Penmanship	3	3	.....	.....	.....	.....

Provisions are made for instruction in the Hebrew language and greater proficiency in drawing, if desired; also for singing and gymnastics, out of regular hours. Writing and speaking in the classic tongues, and conducting final examinations in Latin, have the authority of old custom, and, in general, are strictly adhered to, as may be judged from the amount of time devoted to these studies. So faithfully are the ancient standards of these schools maintained, that private and unpaid lectures in them—upon the classics, and upon subjects relating thereto—are quite frequent; and the last words of the teacher to the taught, as he goes out to the larger opportunities of study or of life, are usually to inculcate unremitted exertions to classical attainments.

Of contemporary date, a course of study in first-class real schools embraces the following range of study, with time, &c., arranged as follows:

Course of study in first-class real schools.

Subjects.	Hours per week for each class.					
	VI.	V.	IV.	III.	II.	I.
Religion	3	3	2	2	2	2
German	4	4	3	3	3	3
Latin	8	6	6	5	4	3
French	.....	5	5	4	4	4
English	.....	.....	.....	4	3	3
Geography and history	3	3	4	4	3	3
Natural history	2	2	2	2	6	6
Mathematics and arithmetic	5	4	6	6	5	5
Penmanship	3	2	2	.....	.....	.....
Drawing	2	2	2	2	2	3

From this it will be seen that the real is not a "technical school," from which Latin is usually excluded, having derived its name "*real*" from that foundation laid in 1747, by Councillor Hecker, who established a joint school of learning and of arts from which, in their severance, have sprung the famous Frederick William Gymnasium and the Royal Real School of Berlin, the avowed purpose of which, in its departmental organization, was, "that pupils should be taught not by words merely but by *realities*, explanations being made to them from nature, from models, and plans, of subjects calculated to be useful in after life." The differences, as well as the harmonies, between these schools are worth considering.

The declared end of the real school is, "to prepare, by scientific education, for those higher vocations of life for which academic studies are not required." And yet it is further said that "the practical requirements of the time are not a measure for their organization, but the object to develop the mental faculties of such youths as are intrusted to the teaching of these schools to such a degree as will fit them for an independent realization of the duties of life; and that, like the gymnasium, they must work by general means, while dividing between themselves the elements of that complete instruction which pertains to the different professions and pursuits."

The good-fellowship existing between these now distinct classes of schools is shown not only by their courses of study, by their directors—sometimes the same person—but by their time-tables arranged for the economy and convenience of both. The real school begins lower down and stops three years short—receiving pupils at seven, and sending them out at sixteen years of age; while the gymnasium receives at ten, and dismisses at nineteen years of age. Having the same elementary basis, it is from the first year of the gymnasium and third of the real school that a divergence begins; but, even here, not so great but that the pupil of the latter, by giving proper attention to Greek during the seventh and eighth years of his study, (fourth and fifth of the former,) may, at the conclusion of his eighth real year, pass into the sixth of the gymnasium and there continue his studies until the conclusion of the time and course.

These institutions, the gymnasium and the real school, are the pride of the German people; and well they may be, for in no schools in the world are physical, intellectual, and moral discipline so admirably harmonized, and made effective in the great work of developing and furnishing the youthful intellect with the implements of future possibilities.

ENGLAND.

The higher secondary education of England needs but reference to the fact of its exclusively classical character, found now, as in the past, in a number of its better endowed and administered grammar schools, and its great public schools which take rank with some of the colleges of

other countries. Great scholars and good men have adorned and blessed the race through the instrumentalities these schools have furnished their native genius and inherent worth. In the interest of this special department of education, a bare reference is made to exhibits believed to be largely attributable to the school policies of two countries, one of which has done the most and the other the least toward popularizing it, before passing to a review of such as take middle ground.

It was about the year 1806 when, with a population of 10,000,000 and embarrassments of poverty and humiliation such as few nations have ever met, Prussia began, in earnest, to devise and make available to a suffering people the scheme of public-school instruction which challenges the admiration of the world, and which, in the fifty years between that date and 1856, brought to its 17,000,000 of people an income of more than three hundred per cent. over that of the former, resulting from an improved agricultural industry and a manufacturing wealth apparently created, as its political economists declare, "out of nothing."

In 1818, with a population something over 11,000,000, the expense of pauperism to the English government was little short of £8,000,000. In 1859, with a population less than 20,000,000, the percentage of paupers in England and Wales was 4.6 to the whole number, and the expense of these in the pro rata of 5*s.* 6*d.*, ($1 37,) and costing the government, in connection with special aid from the city of London, scarcely less than £10,000,000. Between these dates, 1833 saw the first public grant to elementary instruction in the pitiful appropriation of £20,000, annually, for a term of five years.

While the public economist is figuring the totals of these and bills of expense that cover the "poor rates" of intervening years, the public educator may be permitted to speculate as to the probable results had these sums been exhausted in inaugurating and encouraging the educated labor of the lower classes.

RUSSIA, ITALY, FRANCE.

In the higher grades of intermediate education, the gymnasium of the German system is reproduced in Russia and Italy, as in many of the countries not specifically mentioned, and with such differences of completeness as might be expected of their various political and social states; but, wherever found, always ministering to classical proficiency in still superior culture.

In Italy and France, lower intermediate education, whether in practical or classical directions, finds the higher advantage of both in the lyceums where general courses of instruction are arranged, including well selected and greatly advanced branches from both. There, too, are found special courses for each, embracing what is esteemed most valuable for the end sought.

A general course, in a lyceum for either country, includes a thorough course of Latin and Greek, with some optional modern language—usually

German or English—rhetoric, philosophy, national literature, civil history, mathematics, and a wide range of the natural sciences. The time required for such a course is usually six years, after the ordinary preparation of from two to three years in some lower secondary school, bringing the youth to his eighteenth or twentieth completed year of age, according as preceding instructions have advanced or delayed him. The earlier French requirement that a student having completed this general course, and passed examination, must give an additional year to the study of philosophy, and, after that, the same to the higher mathematics, before receiving his degree of letters or of arts, has been so modified that it is not a public-school requirement, but an advantage which, if secured by the required time and labor, is recognized in the certificate of dismissal. It is also of more recent adoption, in both France and Italy, that the certificate of completion in the scientific course, which was formerly dependent upon that of letters, having been attained, is now independent of it and secures to the holder of this alone, as of that alone, equal opportunities in the military and postal service; though neither, separately, gives the advantage of a general certificate in the wide range of opportunities that lie between those and the superior positions of the highest professional callings.

All these, and numerous other institutions which, like the lyceum, gymnasium, real schools, and schools of arts, are scattered all over the continent, are not encouraged, alone, but are supported mainly—often wholly—by the governments where they are fostered. As such schools have multiplied, the power of the government to elevate the populace has increased, and the wealth of the people to maintain the elevation.

UNITED STATES.

A review of the superior intermediate education of the United States has been left out of immediate connection with that of other countries, because it is not here, as a whole, nor yet in any of the several States, a part of our public-school system.

The public high school has been noticed as belonging to the lower grade of secondary institutions, and such it is, and must be, so long as it remains the next advance to the higher primary school. But to draw a line, placing all of our public high schools on this level, would be unjust to those that rise quite above the average, challenging comparison with our incorporated academies, and such schools of isolated eminence as embody our most advanced ideas upon this subject. These higher high schools, these academies and schools, of whatever name, that lead the advance of our secondary instruction, are, in fact, equal to some of our colleges.

For schools of the class above indicated, pages would be needed to allow them so much as a mere honorable mention; while to give a fair idea of the educational value of any considerable number of them would lead to a list of organizations, studies, methods, results, endow-

ments, &c., which would minister to the pride which an American naturally feels in the munificence of our school provisions, both public and private, but which provision is still, without doubt, most unequal to the popular demand, as is the education it furnishes for the outlay actually made. How can it be otherwise, when no two of the States, and no two of the great public high schools of the same State, are a unit in anything relating to their interests, the same variety extending to the entire range of incorporated academies and individual seminaries, of every rank between the high school and the college proper? The youths whom the fortuities of life have thrown upon their own judgment are left to the complexity and perplexity of endless comparisons of value in the institutions that offer their services in this department of instruction, which is the finishing up of the educational tuition of by far the largest number of those who represent the intellectual wealth of the country. The delays of choice result in loss of time; while choice is often the occasion of vital mistakes and loss of opportunities never to be regained, to say nothing of the mere pecuniary extravagance of frequent and wholly useless change of text-books, and the material appliances of the courses of study selected. From this, too, come those false estimates which often accredit superficiality, and make ignorance respectable in the responsible positions of home, school, society, and state. There is no advocacy of the favorite notions of any leader of reform in our school policy, much less that wisdom dictating a uniformity such as the examples of various nations furnish, in suggesting, as the best that can be done, and that ought soon to be done, a standard below which the higher grade of secondary instruction could not be permitted to fall. Accordance of standards could, no doubt, be easily secured in all the educating States, and any lower than these would scarcely be thought of in those that must ere long inaugurate some schemes for the neglected instruction of their communities. By such an accordance as this, secondary education would emerge from the misty atmosphere of uncertain value, which now surrounds it, to a dignity appropriate to its end, and to the position of that immense number of persons who depend upon it for the limit of their school advantages.

Under the present independent organizations just referred to, a wide range of acquisition is attempted, and a very respectable degree of discipline secured considering two very radical mistakes—the inadequacy of time allowed and the immaturity of age on dismissal—to be hereafter noticed. This range of acquisition embraces, very generally, that element termed "popular," that has in recent times revolutionized the secondary education of the civilized world. Next to, and almost coincident with, the recognition of science as indispensable to the business of life, and valuable as an educational aid, by the great Germanic confederacy, its claims, in both regards, began to be advocated by the good and far-seeing leaders of the school fortunes of our young republic. The fact that the nations over the sea have pursued so much more positive

courses of action, in giving these truths distinct organizations, arises from a combination of circumstances and conditions that were not found here, but something like which are coming to be more imminent and are only to be met by these or better ways in the same general direction.

It was the present century that began to press the need of this accessory to our school instruction; and before the first third of it had passed, the gracious liberality of such men as Phillips, and Lawrence, and Peabody, and those illustrious many more who gave of princely fortune or personal sacrifice to the endowment of schools where not alone were to be found "the advantages of general higher culture, but a fitting for the purposes of life," called out the championship of eminent classical scholars, such as President Wayland, Edward Everett, and Horace Mann, in favor of a more universal incorporation of scientific and mathematical studies in all schools above the primary. As a consequence, it is to-day hardly respectable for the scholarship, or safe for the pecuniary interest, of a school to announce itself as exclusively devoted to classical instruction. To be sure, such honorable exceptions as the Boston Latin School stand secure, as the intelligence of the community sustains it; but right there stands, also, the English High School, not unfrequently named by foreign educators as the model school of American development. The great, free academies of Norwich, Connecticut, and of New York City; the Public High School of Philadelphia; the most excellent old and new Woodward and Hughes High School of Cincinnati, and the high school fostered by the generous purse of Chicago, all provide, besides a very liberal general course of substantial classical and modern instruction, special courses of classical, scientific, and normal value. In these schools, and in others like them, are found theoretically, and to some extent practically, an encouraging growth in the valuation of music and gymnastics, as aiding both soul and body in the work of development.

Growing out of these more excellent examples, schools that bear the same titles, but with greatly inferior equipments, undertake to do the same work; while not even these last give the time that enables pupils to make thorough work of making their own both the knowledge and the discipline that would otherwise be secured. If, in an exceptional case, these are secured, how often does it prove to have been by making thorough work of undermining all possibilities of future usefulness by hopelessly impaired health? From three to five years—the average is less than four—are not enough for young people of either sex, and of fair physical conditions, to secure the advantage now offered by the courses of instruction in a first-class American high school or academy; much less will it be sufficient to the added value of these courses, as they adapt themselves to the growing demand for more thoroughness in the general, and more utility in the special tuition given. The time would not be equal to the range already given in letters, physics, and art, were the young people of our more advanced school population shielded from those encroachments that the social life of home and associated amuse-

ments now thrust upon them. It is not that the home or the community furnishes too much relaxation; but that the unseasonableness of such privileges and such hours as they require make them a tax, rather than than a recreation, to the youthful mind and body.

To "make haste slowly" should be the maxim of school, and the maxim of home, until, by incorporation into the very being of the individual, it comes to be the habit of life.

Of our secondary instruction, it cannot be said to be gratuitous, as is the primary, wherever the provisions for it have been accepted; but its expense is so reduced by reason of being largely furnished in institutions founded upon the liberality of private means, that a reference to the total of these contributions is due to the benefactors, as the cause, of this department of our popular education.

An approximate of $100,000,000 is doubtless within the limit of actual fact as an endowment of secondary and superior instruction in the various institutions that have been the recipients of individual bounty. From latest reports, the income of academies and secondary schools from such sources, as compared with that of higher institutions from the same, is as five to two.

The latest returns of the whole number of students in higher secondary, as compared with those in college and university courses, is as ten to one. Partial but later returns from various parts of the country show an increase in the patronage of intermediate schools by that exceeding generosity that has marked the recent years, no less than the wisdom of the direction this stream of private benefaction has taken, by the still larger proportion of pupils found in our middle range of instruction.

Leaving out of consideration those public schools of this grade where instruction is on the same terms of entire gratuity as in the common school, and those conducted as sources of profit by individuals or corporations of individuals, it would not be extravagant to make the reduction of from one-half to two-thirds of the expense of academical education, as due to the endowments originally made or since received.

In some it is gratuitous by terms of the grant—the localities to bring up the deficiency of any needed sum to maintain the efficiency of the school—open to any who seek admission. In others it is gratuitous to the extent of a given number of scholarships for the more needy, while such as are able pay full tuition. Again, localities are bound to keep the institution in buildings and in whatever relates to the outfitting, while the endowment income is applied to enlarging and paying for appropriate courses of instruction. In many instances these schools have annual appropriations, thus bringing the treasury which comes of the wealth of the state to bear upon the intelligence of a community that needs it, without recourse to a local tax. As in my judgment the wisest, and most in accordance with our educational theories, Massachusetts, at an early day, set the example of taking all incorporated academies into the scheme of its public school instruction, and so fostering

that advancing culture which the larger elementary education of this pioneer State made earliest noticeable.

While I would be far enough from indorsing the opinion of a recent writer upon academic education by the statement that "these intermediate schools are the place for a majority of our young people who have no need of higher culture, and have no business in college," I would take the ground that the majority of our youths, of both sexes, find it convenient to limit their school-training to the courses here pursued, and that the course of study in a first-class American academy is often equal to that of an American college. If, in a given case, an academic is equal to a collegiate course, the ambitious student who goes out from the former has this advantage over the latter—that of being more likely to remain a student, and so rise to eminence in any chosen pursuit, because of a need he seems himself to have, in having missed a collegiate course; while the possessor of such honors, resting too frequently upon them, does not rise above the scholarship of his graduation.

In conclusion, the aim of primary instruction, to furnish the essentials of human knowledge to all, whether they are individually to do anything or to become anything but human beings or not, is scarcely more worthy or likely to find a speedier realization than that of secondary education, to furnish the class—only less numerous than all—who are to do something, and who must become something whereby to live, with a knowledge of the best ways of converting the sweat of the brow, the craft of the hand, or the skill of an art into the resources of a contented and honored life.

And not this alone. The aim of secondary education will not be high enough until it reaches and keeps the steady mark of an endeavor to combine the demands of a general liberal education with practical training for the duties of civil life.

I said "in conclusion," but find myself loth to leave this subject, which has been considered not only educationally, but also in the light of governmental exigencies and popular demands, without affording both sides of its controverted values a fair opportunity of comparison. It is not true that scientific study has had to force its present school recognition against the opinions of the world's ablest thinkers. While it has had the opposition of able men and the prejudices of caste to meet, it has also had the aid and stimulation of encouragement from high authorities of both classical and scientific culture as to its disciplinary value; while from both sides has come a unity of evidence as to the value of the fund of knowledge it brings.

From a wide range of testimony that could be indefinitely accumulated, it is proper and of use to consider the words of a few, in our own and foreign lands, most of whom are men eminent in classical attainments, before passing a final judgment upon a point so vital to the interests of our people.

A few years ago, in a letter to a friend who sought advice in regard

to the establishment of a college of secondary rank, Sir John Herschel says: "A good, practical system of public education ought, in my opinion, to be more real than formal; I mean, should convey much of the positive knowledge, with as little attention to mere systems and conventional forms as is consistent with avoiding solecisms. This principle, carried into detail, would allow much less weight to the study of the languages than is usually considered their due, while it would attach great importance to those branches of practical and theoretical knowledge whose possession goes to constitute our idea of a well-informed gentleman. In a country where free institutions prevail it would seem to me that some knowledge of political economy, of jurisprudence, of trade and manufactures, is essentially involved in the notion of a sound education. A moderate acquaintance, also, with certain of the useful arts, such as practical mechanics or engineering, agriculture, draughtsmanship, is of obvious utility in every station in life; while in a commercial community the only remedy for short-sightedness to best interests seems to be to inculcate, as a part of education, those broad principles of interchange and reciprocal profit and public justice on which the whole edifice of permanently successful enterprise must be based." And further, he says: "I should be the last to depreciate the value of classical scholarship; but it is bought too dear if obtained at the sacrifice of improving the general intellectual character by acquiring habits of concentrated thought, and by accustoming the mind to the attitude of investigation and induction while it is yet plastic and impressible."

In a discussion of the educational values of the extremes of scientific and classical culture, and which is conducted with that broad and truly catholic spirit characterizing this great man, Dr. Wayland asks: "Is it possible that our brief probation on earth has been furnished with these two kinds of antagonistic knowledge—one necessary to the attainment of security and happiness, but incapable of nourishing the soul; the other tending to self-culture, but leading to no single practical advantage? Are we to believe that the many are to labor, by blind rules, for the good of the few, who, learning nothing that can promote the happiness of the whole, are building themselves up in intellectual superiority? Is it not rather the intention of the All-wise that all intellectual culture shall issue to knowledge that will benefit the whole, and all knowledge properly acquired tend to equal intellectual development?"

From an address delivered by the late Prince Albert, at Birmingham, the following words are quoted: "No human pursuits make any material progress until science is brought to bear upon them. The laws of grammar, which find their purest expression in the classical languages, are important studies in training and elevating the mind, but they are not the only ones; there are others whose knowledge we cannot disregard, and whose discipline we cannot do without."

In an address on "integral education," by Dr. Hill, president of Harvard University, these words are found: "By confining children to books

and withdrawing them from visible objects their powers and capacities are not tested. Errors come less frequently from illogical reasoning than from inaccurate observation. A witness who can state clearly what was seen and heard is rarer than a sound lawyer or judge. If education is to develop the mental powers, it is also to open a field for their exercise. I doubt whether any training can materially augment the actual strength of imagination, or reason, or any other mental faculty; but I do not doubt—on the contrary, I earnestly maintain—that education may give a man such skill in the use of his faculties that, for all practical purposes, they will be ten-fold their original value."

Lord Macaulay, learned and elegant in the scope of his scholarship, in an "Essay on the Athenian Orators," gives his view of an exclusively classical course of instruction: "Modern writers have been prevented by many causes from supplying the deficiencies of their classical predecessors. At the time of the revival of literature no man could, without great and painful labor, acquire an accurate and elegant knowledge of the ancient languages; and unfortunately those grammatical and philological studies, without which it were impossible to understand the great works of Athenian and Roman genius, have a tendency to contract the views and deaden the sensibility of those who follow them with extreme assiduity. A powerful mind which has been long employed in such studies may be compared to the gigantic spirit in the Arabian tale, who was persuaded to contract himself to small dimensions in order to enter within the enchanted vessel, and when the prison had been closed upon him fancied himself unable to escape from the narrow boundaries to which he had reduced his stature. When the *means* have long been the objects of application, they are naturally substituted for the *end*."

The above testimonies have regard to the disciplinary value of scientific studies, to which is added evidence from men who are distinguished in both letters and science as to the comparative values of both discipline and knowledge resulting from the exclusive or the related studies of these two great departments of human learning.

From John W. Draper, author of the "History of the Intellectual Development of Europe," and now of the University of New York, we have this: "Education should represent the existing state of knowledge, but in America this golden rule is disregarded. Here, what is termed classical learning appropriates to itself a space that excludes more important things. This arises from the circumstance that our system was imported from England. It is a remnant of the tone of thought of that country in the sixteenth century—meritorious enough in that day, but not in this. The vague impression that such pursuits, and such alone, impart a training to the mind has long sustained this unwise course. It also finds excuse in its alleged power of communicating the wisdom of past ages. The grand depositories of human knowledge are not the ancient but the modern tongues. Few are the facts worth knowing that are to be exclusively obtained by a knowledge of Latin and Greek; and

as to mental discipline, it may very reasonably be asked how much a youth will secure by daily translating a few sentences of good Greek and Latin into bad English. Whether for discipline or for furnishing, so far as preparation is required for the subsequent conflicts of life, tradition has been made to confront discovery."

After giving his idea of the discipline of classic studies as a pursuit, Lord Macaulay says further, in regard to the knowledge thus gained: "A scholar of great learning recommends the study of some Latin treatise, of which I now forget the name, on the religion, manners, government, and language of the early Greeks; 'for there,' says he, 'you will learn everything of importance that is contained in the Iliad and Odyssey without the trouble of two such tedious books.' Alas! it had not occurred to the poor gentleman that all the knowledge to which he attached so much value was useful only as it illustrated the great poems which he despised, and would be as worthless for any other purpose as the mythology of Caffraria or the vocabulary of Otaheite."

In "Lectures on History," Professor Goldwin Smith thus balances the reasons for and values of classical and modern culture: "When education was classical, classical learning was not then, as now, a gymnastic exercise of the mind in philology, but a deep draught from what was the great and almost the only spring of philosophy, science, history, and poetry. It is not to philological exercises that our earliest Latin grammar exhorts the student, nor is it a mere sharpening of the faculties that it promises as reward. It was to open a great treasury of knowledge and wisdom as the meed of the student's labor in those days, and which our days, not degenerate from theirs in labor, are directing to a new prize. In choosing the subjects of study, if you desire any worthy and fruitful effort, you must choose such as the world values, and such as may receive the allegiance of a manly mind. It has been said that six months of the language of Schiller and Goethe will now open to the student more high enjoyment than six years' study of the languages of Greece and Rome. It is certain that six months' study of French will now open to the student more of Europe than six years' study of that which was once the European tongue. There are changes in the circumstances and conditions of education which cannot be left out of sight, and which must be taken into account when we set the claims of classical against those of modern culture."

From evidence given before the English public schools commission, of recent date, and embracing a great number of men distinguished in the various walks of learned life, that of W. B. Carpenter, registrar of the University of London and member of the council of the Royal Society, is given, for the reasons that he is widely known in our country as the author of standard physiological and related works, and that his testimony covers a wider range of inquiry in all that pertains to science as an educator than that of any other person with whose views I am acquainted. The questions of the commission are distinctly stated, and

are substantially these: whether Mr. Carpenter had been able to form any opinion as to the comparative value of scientific and mathematical studies in the work of mental training; whether a training of mathematical and classical studies combined would have an advantage from the addition thereto of the physical sciences; at what age such studies could most profitably begin, as compared with classical studies, and whether the power of sustained attention, in quite young students, would or would not be damaged by early interest in physical studies; whether he spoke from experience, from observation, or from both, in his estimation of the inherent value of those studies, as of the ages when they should begin.

To these inquiries the responses were made in great detail and clearness of language and illustration, and, as briefly as they must be given, were to these conclusions: that the physical sciences and pure mathematics had each a quite different function in the work of mental development, and that neither could be omitted, without distinct loss, from a public-school education; that when the classics and mathematics were combined, the discipline secured is one-sided, the physical sciences calling into exercise a set of mental powers, and combination of powers, that neither the pure classics nor the pure mathematics, singly or together, can develop and train; that a good teacher and a good method will find no difficulty in securing the sustained attention of even a quite youthful student, while presenting a variety of the objects and the facts of nature—perhaps not so much as in keeping this attention directed to the study of a book; and that, if intended as a specialty, classical study is not damaged by the delay of a few years, as would be scientific study, specially considered—the faculties by which scientific observation and analysis are carried on being of earlier development; and that, general culture or superiority in both being sought, a fair discipline and furnishing from the studies of physical science ought always to precede the study of letters, as such; that he had, personally, a very high appreciation of the value of classical studies, not that he so much liked them in the day's when he had been required to give them what he had since come to feel was a precedence, and an amount of time they did not merit; but that, liked or not, he would not advise leaving them out of the general training of the young, while, in youth as in advancing years, he would see that they did not defraud those mental faculties that ought first to have development in the studies that brought them into active use, and that ought, through the entire educational process, to be enlarged by the continued pursuit of those branches that are their legitimate field of research and application.

SUPERIOR GENERAL EDUCATION.

CHAPTER V.

SCHOOLS OF LETTERS, SCIENCE, AND ART.

Schools of letters in England—France—Italy—Switzerland—United States—Schools of science—Sheffield scientific school—Lawrence scientific school—Faculties of philosophy in European universities—France—Italy—German States—Great Britain—Science and art department—Schools of art.

I.—SCHOOLS OF LETTERS.

The secondary education, of which notice has been made, was marked as being in its higher range the outward limit of instruction in the schools found possible to any considerable portion of the people of even the most advanced country. The superior education of a people, however it may compare with that of other nations, is found in that highest culture furnished as a basis for life, or the pursuits of life, which any of its institutions of learning, not professional, may provide.

At first, when the total of human knowledge was narrowly limited, not only in range, but in the number of those who possessed it, this superior education was of but one order and was known as philosophy; the instruction given to such rare seekers after the higher knowledge as gathered about the philosopher in academic grove or temple porch to receive it, consisting chiefly of the principles of social life, of poetry, of rhetoric, and of geometry. As, in course of time, knowledge spread into countries other than those in whose language the best models of poetic composition, the profoundest doctrines of social and political philosophy, and the highest attainments in geometry were embraced, the study of language also had a place in the highest schools, which then became schools of philosophy and letters. But at length the borrowing nations produced new theories of philosophy and new models which, in turn, required to be studied, and thus, by multiplication, the study of language occupied so large a place that the order was reversed, and the schools of philosophy and letters became schools of letters and philosophy. This last form they preserved throughout the Middle Ages, and this they maintained, without modification, until the finding of the keys to the arcana of nature resulted in opening new fields of study and brought innovations upon the old order of things.

At first, the demands of science were only for a single place in the great schools, from which to teach its new revelations. But no sooner was this granted, than it demanded another, and another; and so grew

up that struggle between the humanities and the sciences which to-day constitutes the most interesting phenomenon of the educational world, and presents that most difficult problem for its solution, to which reference has already been made under a previous head.

As might have been anticipated, the result of this contest, so far as it relates to the superior schools, has been various in the different countries; the encroachments made by science having been determined in character and extent by the intellectual stamp of the people, the degree of social development, and the material conditions involved.

ENGLAND.

In England, parent of the new philosophy and of some of its most distinguished promoters, the resistance has been more marked than in any other country of Europe; and innovation has been less successful. The thick walls of Cambridge and Oxford, for centuries the defense of scholasticism and monasticism, long held out in proud defiance against the invaders, in spite of the battering rams of their mechanics and the yet more dangerous compounds of their chemistry. But neither the one nor the other of these strongholds has entirely held its own. At Cambridge the sciences entered by the unbarred gate of mathematics; and Oxford, at last alarmed by the multiplying hosts that gathered for a final assault, has also made partial and conditional capitulation; admitting only a few of the invading chiefs to its inner courts and prouder halls.

But even now, the physical and natural sciences do not breathe freely in their new homes. The humanities are not only still dominant, as they probably always will be, but treat the sciences with a certain proud imperiousness that ill comports with comfortable, much less equal, association. These ancient schools are still the great schools of letters in England. From their halls of classic culture, and from the like schools in Scotland and Ireland, for many centuries have gone forth a multitude of those orators, poets, philosophers, and statesmen, whose surpassing genius, disciplined and perfected by scholarship, has given to the world so many of those great productions of literature, science, and constitutional law which are at once the richest legacy and the highest glory of humanity. It is natural that such schools should be cherished by such a people, and that change of any sort should seem a desecration.

The present status of Cambridge and Oxford is more nearly that of a college (using that term in the English and American sense) than formerly, when they embraced professional schools of theology, law, and medicine, and were, to that extent, "universities" in fact, as well as in name. They still have authority to grant professional degrees and do annually grant them. But the principal part of the professional study requisite to the honors they confer is had at London, which is the scientific as well as commercial and governmental center of the kingdom. And yet these schools are not colleges; they are rather clusters of col

leges, or "federations of colleges," each having its own organization, laws, teachers, and pupils, but all under the superior supervision and general control of the university senate, by whose council the general laws are administered, and by whose grace all honors are conferred. The number of the colleges at Oxford is twenty-four; at Cambridge, seventeen. The instruction in the several colleges, each of which is essentially a school of letters, is given by tutors who became such on receiving the degree of bachelor and being elected fellows of the college. But there are also university teachers—thirty-five at Oxford, and about the same number at Cambridge—and these also bear the title of professor. The professional instruction is given by lectures, upon which, however, the pupils of the several colleges, though at liberty to do so, are not bound to attend. And inasmuch as the attendance upon lectures imposes an extra labor upon the pupil, already burdened perhaps by the routine of studies in the college to the limit of his willingness to study, the teaching is practically left to the tutors; but few of whom are teachers by choice, or, in the best sense, teachers at all. The consequence is, that the high rank these two ancient institutions once held has been so far degraded, that even at home they are no longer regarded as universities by the most enlightened and liberal educational men of the kingdom—one of whom but lately, in an official report to the schools inquiry commission, had the frankness, perhaps boldness, to style them mere *hauts lycées*, which, it will be observed, I have felt bound to class with schools of secondary education.

Whether the general overhauling of the institutions of England, political as well as educational, now going on, will result in the reorganization of these schools upon a more philosophic basis, remains to be seen. But of this there can be no doubt, that, at the present, the searcher for schools of letters of a high order, who may go to Oxford and Cambridge for the realization of his desire, will surely come away with a most profound disappointment. I cannot agree with those innovators who would turn them inside out, or upside down, in order to plant schools of science in their stead. For though schools of science are essential to progress in education as well as material development, schools of letters are no less essential; and where better could they flourish than at these grand old seats of the humanities, whose very memories may be made a healthy inspiration to all lovers of letters in England?

FRANCE.

The spirit of France, educationally speaking, is, as before remarked, eminently scientific. It is there that mathematics and the physical and natural sciences find the most congenial soil for their expansion and upward growth. But there, also, the humanities have a place and are cultured with exceeding care. Both are cherished and both honored. In the *Académie de Paris*, at the Sorbonne, the *Faculté des Lettres*, with its distinguished professors of philosophy, of the philosophy

of history, of Greek literature, of Latin eloquence, of Latin poetry, of French eloquence, of French poetry, of foreign literature, of geography, of ancient history, of modern history, and of the languages and literatures of the South, stands side by side, in the most cordial harmony, with the great *Faculté des Sciences*—neither jealous of, but each nobly emulating, the other by the brilliancy and utility of its accomplishment. So, also, in each of the other fifteen academies of the empire, science and letters have a place on the same plane; the total number of chairs in the faculties of letters being eighty-six; in those of science, ninety-seven.

And there, too, is the *Collége de France*, in which eleven chairs of science have friendly relations with the twenty-one chairs more especially belonging to the domain of letters and philosophy, namely: Of the law of nature and of nations; comparative history of legislation; political economy; history and moral philosophy; epigraphy and Roman antiquities; Egyptian archæology and philology; Hebrew, Chaldaic, and Syrian languages; Arabic language; Turkish language; Persian language and literature; languages and literatures of China and Tartary; Sanscrit language and literature; Greek language and literature; Latin eloquence; Greek and Latin philosophy; French language and literature of the Middle Ages; modern language and literature of France; foreign languages and literatures of modern Europe; Slavic language and literature; and of comparative grammar, together with complementary courses on the history of medicine, and the history of political economy.

Nor is this all: Paris possesses still another remarkable school of letters in the Imperial School of Living Oriental Languages, in which there are chairs of, learned Arabic; vulgar Arabic; Persian language; Turkish language; Armenian language; modern Greek; Hindoostance; modern Chinese; Malay and Javanese; Algerian Arabic; Thibetian; and Japanese.

No matter what its degree of devotion to the sciences, it can hardly be said of a country, at whose capital are clustered great schools of letters like these—schools in whose numerous chairs are found such men as Chevalier, Laboulaye, Guizot, and a galaxy of others of the most distinguished savans of the age—that it does not still cherish its hereditary love of the humanities.

That letters ought to have a higher development in provincial France is undoubtedly true; but this same is also true of every other department of its education. Independent of its great capital, France is only now awakening to some realization of the contrast the empire at large bears to its dazzling center.

ITALY.

Italy, which, in the character of its higher institutions of learning, is less eminently scientific, but equally or more literary, provides for the high cultivation of letters in like manner, to wit, by means of faculties in the universities. There, however, philosophy is so associated with

letters that separate degrees are conferred upon such students as confine themselves to the one or the other course. The terms of admission are based upon the assumption that no one will present himself to the *Facoltà di Filosofia e Lettere* who is not able to produce his certificate of having completed the course in the lyceum and to undergo an examination upon the Italian and Latin languages and literature, Greek grammar, ancient history and geography, and the elements of philosophy. The term of study in each of the two branches of the faculty is four years; the course in letters being as follows:

First year. Greek literature; Italian literature; Latin literature; ancient and modern geograhpy; ancient history.

Second year. A continuation of the various literatures named, with the addition of modern history.

Third year. Continuation of the studies of the second year, with the addition of anthropology and pedagogy.

Fourth year. Greek, Latin, and Italian literatures, with archæology, comparative study of languages and literatures, and the philosophy of history.

The philosophic course embraces—

First year. Latin literature; ancient history; theoretical philosophy; anthropology and pedagogy.

Second year. Greek literature; theoretical philosophy; history of philosophy; modern history.

Third year. Greek literature; moral and practical philosophy; history of philosophy; theoretical philosophy.

Fourth year. Moral and practical philosophy; history of philosophy; comparative study of languages and literatures; history of philosophy.

The degree conferred in either case is the doctorate; and the student, who having completed one course and received the degree, is also able to pass the requisite examination upon all the branches of study taught in the other course, may also receive the other degree. The great partiality natural to the Italian mind for legal and philosophic studies had long led to the cultivation of letters to a higher degree, than any other department of learning. But with the dawn of science there arose so brilliant a constellation of great discoveries in chemistry, physics, and astronomy, that for a time letters were dimmed in their brightness, and only again appeared in the supremacy upon the reaction that followed the Reformation and gave to the church new power over all the schools of learning. While, therefore, letters and philosophy are cherished in Italy and hold high rank in the great schools of the present, they still wear the impress of a learning distorted, cramped, and doubtingly waiting for the vitalization that is to come with the promised new reign of freedom and independence of thought.

GERMANY.

But Germany is the natural home, and the free home, of letters. Nowhere else in the world do they receive such careful, thorough, and

universal culture; nowhere do they so represent the best there was in the dead past and the all there is of the living present. The great German mind, though slow and steady in its operations, is broad enough and profound enough to take in the whole circle of learning, and so give each, in its development, the advantage of every other department. From the lower class in the gymnasium, upward through that magnificent range of studies presented by the *philosophische Facultät* in all of its universities, completion of which is essential to the doctorate—the only degree conferred—there are a comprehensiveness and a thoroughness that compel the admiration of the lover of true learning whatever his nationality or his prejudices. He may deprecate the tendencies of German philosophy and German theology, but the fire of his enthusiasm is unavoidably kindled by the near contemplation of the patient and masterly manner in which the real German student does his work.

The sciences are found there, having long since been welcomed with open arms, and are also cultivated with equal zeal. But there is no sacrifice of one to the other, and no jealousy between them. Here, as in France, they flourish under the same impartial fostering care. But there are no great separate schools and purely literary faculties of letters in Germany; and hence an account of the German culture of letters would, of necessity, involve an account of its many celebrated universities, notice of which is reserved to a subsequent chapter. Berlin, Halle, Leipsic, Vienna, Munich, Tübingen, Heidelberg, Göttingen, and Bonn—these are the centers of literary influence; and, I may say without disparagement to the rest, Berlin is the center of centers.

It is a great thing for the world that letters have found so secure an abode; as otherwise the bustling, driving business genius of the present age, seeing no good in, and having but little patience with, anything whatsoever that brings not material gain, would be in some danger of extinguishing their light altogether.

SWITZERLAND, RUSSIA, AND OTHER COUNTRIES.

Of Switzerland, compounded of the three national elements already considered, though wearing more of the Germanic than of either the French or the Italian stamp, and possessing more of the stirring, utilitarian spirit of the times than any of them; of Belgium, cast in the French mold; of Holland, so nearly German in its intellectual type, and in the quality of its spirit and culture; of Scandinavia, also largely Germanic in its educational tastes and tendencies; and of Russia, partly European and partly Asiatic, and yet with a positive individuality and a resoluteness of purpose to take on the best form of civilization attainable—of all these I need not specially write in this connection. In each of them there are numerous mixed schools of high literary order; and the last-named has a school of letters—in the university at Kasan—which, in the number of its chairs of Oriental languages, excels all others in Europe.

UNITED STATES.

What have we now in America to group under this head? If we include all incorporated schools of high title, and with power to grant degrees equal to any that can be conferred at Paris or Berlin, we have literally a swarm of "colleges" and "universities," which, if numerically reported at those educational centers in the Old World, where titles have meanings, would compel the conviction that we were the most learned people on the face of the earth. But if we examine more carefully we find that many of these—it would certainly not be unjust to say very nearly all—are not even *hauts lycées*, but a much lower order of institution; some with two professors, others with three or four, and only a comparatively small number with force sufficient to carry through anything like a respectable curriculum of study in the department of letters alone; whereas, under the pressure of practical necessity at the present time, they are each endeavoring to do the full work of both a faculty of letters and a faculty of science at one and the same time. Under such conditions, and with inferior facilities for illustration in the scientific departments, it is not surprising that most of them fail of accomplishing any part of their work thoroughly and well.

Criticism like this will appear to some of my countrymen unjust, especially to such of them as feel it to be hard enough to carry the load they are staggering under, without being reproached that their walk is not upright, steady, and firm. Should a pigmy be ridiculed for not walking off, Atlas-like, with the globe of Heaven on his head? No; but he may be justly enough blamed for voluntarily assuming the burden intended only for a giant. And this is exactly the position of many of our American colleges. Four-fifths of them have been founded more in the supposed interest of some incompetent village or ambitious religious denomination than in the interest of learning. How vastly better to repress that vain pride or ambition for the wiser concentration of means and forces equal to the building up of a few well endowed, equipped, and officered institutions, really worthy of the name so pretentiously worn by over two hundred of our colleges and universities, whose real rank is among the grammar schools. All such institutions—institutions thus originating and thus assuming unwarranted titles—instead of the great blessing they are generally fancied to be, are, in fact, a serious hindrance to the cause of true learning by degrading its standards, and, through foolish expenditures, diminishing the power of the people to endow and sustain schools of a high character.

And yet, after all, there are, here and there, in the New World, precious fountains of pure learning, of which we have a right to be proud. They need and deserve the fostering care of the State governments, and the practical encouragement of all who are lovers of learning, not less for the elevation and refinement it brings than for the mere utilities that may come of its cultivation.

II.—SCHOOLS OF SCIENCE.

Of distinct schools of this class—separate schools, I mean, strictly confined to instruction in general science, and at the same time, by the extent of their courses of instruction and the strength of their professorial force, equal to the work of giving to their pupils a mastery of the several sciences, mathematical, physical, and natural—I know of none in this country. Nor am I aware of the existence of any great school of mixed character, in which the sciences stand foremost, as language, literature, and philosophy stand foremost in the schools of letters.

Some of the leading colleges and universities of America have departments, more or less intimately connected with them, variously known as "scientific course," "scientific department," and "scientific school;" but none of these fulfill the above conditions.

The nearest approach to this type is made by the Sheffield Scientific School of Yale College, New Haven, Connecticut, and the Lawrence Scientific School, connected with Harvard College, (at Cambridge, Massachusetts;) the instruction in which is certainly of the first class, being given by some of the most distinguished scientific men of our times.

SHEFFIELD SCIENTIFIC SCHOOL OF YALE COLLEGE.

I. Its general scope.—The Scientific School of Yale College is a part of the university established in New Haven; its funds are held by the college corporation; its students have access to the general libraries and museums; its graduates are enrolled upon the Yale triennial catalogue; in short, it is one important member of that group of institutions which, in the course of a century and a half, has grown out of the original "Collegiate School of Connecticut."

While thus a part of Yale College, in a broad sense of that term, it is quite distinct from the classical institution commonly called Yale College, and designated on the catalogue as the académic department. Its instructors are appointed by the Yale corporation, but they constitute a body as distinct from the academic faculty as the faculties of law, medicine, and theology. It is this union and this individuality which give the Sheffield School at New Haven the steadines of an old and well-tried institution, with the freedom of a new foundation. The combination has been in many respects highly advantageous to the new department, and is probably not without some influence for good upon the old and well-known classical department. The establishment of a college of science has relieved the academic or classical college from all pressure tending to the establishment of partial courses of study, and has supplemented its means of instruction by new professorships and new scientific collections; while it has rendered a still greater service by giving to graduates of the department of arts opportunities for special and systematic professional training, distinct from that afforded in the schools of law, medicine, and theology.

On the other hand, the scientific school has had the benefit of the name and repute of Yale College throughout the land. The long-established libraries and cabinets have been opened to the scientific students, who have also attended many courses of the academic lectures. More than all this, many of the officers of the old Yale College, by their influence, encouragement, and counsel, have given to the new college assistance too valuable and enduring to be ever forgotten.

Under these circumstances, it is pleasant to add that, during all the wide-spread controversies between science and letters as means of instruction, the utmost harmony has prevailed among the friends of both in New Haven.

The scientific school is designed to give instruction in the various branches of mathematical, physical, and natural science, with reference alike to the promotion of high intellectual culture, the acquisition of useful knowledge, and the preparation for the various modern professions. While scientific and technical studies are thus made predominant, all candidates for the bachelor's degree are also required to pay attention to linguistic studies, some knowledge of Latin being required for admission, and the study of German, French, and English being continued through the course. In other words, the school aims to make good scholars by modern methods and for modern vocations. It has arrangements for the instruction of three sorts of students: the under-graduate, the post-graduate, and the special; and it is clearly the aim of the instructors to make it a school of science, in the higher acceptation of that phrase, rather than a polytechnic or trade school, in the usual European sense. The requirements for admission are high, the examinations thorough, and consequently the graduates are, as a general rule, superior young men, eagerly sought for in responsible positions.

II. Its history, endowment, and organization.—The Sheffield Scientific School of Yale College was begun in in 1846, and is so organized, as we have stated, to give advanced instruction in various branches of physical, natural, and mathematical science, and, to some extent, in linguistic and historical studies.

It bears the name of its chief benefactor, Mr. Joseph E. Sheffield, of New Haven, who has given to it, since 1860, a building twice enlarged and improved at his own expense, apparatus, and models, a library fund, and an instruction fund of over fifty thousand dollars. The school is also the recipient of the Connecticut portion of the congressional appropriation for the encouragement of scientific education, and as such has been recognized by the State as the "College of Agriculture and the Mechanic Arts" for Connecticut.

The fund which was received from this last-named source in 1864 amounts to $135,000, safely invested in six per cent. securities. From other sources the school has received generous benefactions, and a movement is now in progress to secure for it a permanent and ample endowment.

The trustees of its funds are the president and fellows of Yale College, by whom all appointments are made; the interests of the State are protected by a board of visitors, including some of the chief officials of the State; an advisory body of councilors, composed of men from different parts of the country, has been recently appointed; and under the supervision and co-operation of these three bodies, the chief administrative duties belong to the permanent professors of the school, who are called the "Governing Board."

III. THE TEACHERS AND THEIR TOPICS.—There are ten professors who give instruction to the classes of the Sheffield School of Science, not including those professors connected with other departments of Yale College, who are freely accessible to students in science who wish to consult them. There are are also nine other instructors, and a government professor of military science, employed during the whole or part of their time, making in all a corps of twenty teachers.

The work of these instructors may be grouped in four departments: engineering, chemistry, natural history, &c., language, &c., each including as follows:

1. *Engineering, &c.*—Mathematics; civil engineering; mechanical engineering; elementary physics; astronomy, theoretical and practical; analytical and descriptive geometry; land surveying; drawing, mathematical and free-hand.

2. *Chemistry, &c.*—Analytical chemistry, metallurgy and assaying, elementary chemistry, agricultural chemistry, agriculture, laboratory practice.

3. *Natural History, &c.*—Mineralogy, botany, zoology, palæontology, geology, physical geography.

4. *Language, &c.*—German, French, English literature, elocution, linguistics, modern history.

In addition, military science is taught by the professor appointed by the United States.

IV. BUILDING AND EQUIPMENT.—The building occupied by the school was the gift of Mr. Joseph E. Sheffield, of New Haven, and is known as "Sheffield Hall." It is a large and commodious structure, which includes a variety of recitation and lecture rooms, laboratories, museums and cabinets, an astronomical observatory, &c., and is adapted to the instruction of about two hundred students.

The following is a summary statement of the collections belonging to the school:

1. Laboratories and apparatus in chemistry, metallurgy, mechanics, photography, and zoology.

2. Metallurgical museum of ores, furnace products, &c.

3. Agricultural museum of soils, fertilizers, useful and injurious insects, &c.

4. Collections in zoology.

5. Astronomical observatory, with an equatorial telescope by Clark and Son, of Cambridge, a meridian circle, &c.

6. Library and reading room, containing books of reference, and a selection of German, French, English, and American scientific journals.

7. Models in architecture and civil engineering.

8. Philosophical and mechanical apparatus, much of it purchased in Europe during the year 1869.

9. A collection of maps, charts, and reliefs, to illustrate geographical science.

The mineralogical cabinet of Professor Brush, the herbariums of Professors Eaton and Brewer, the collection of native birds of Professor Whitney, the astronomical instruments of Professor Lyman, and several good private libraries are also at the service of the students.

V. STUDENTS AND COURSES OF STUDIES.—The students are of three classes: first, those who are pursuing a three years' course with reference to the degree of bachelor of philosophy; second, those who have already taken a bachelor's degree, and are pursuing higher special studies; third, those who have no thought of a degree and are admitted to particular lectures and exercises corresponding to their requirements. The first of these classes is the largest, the second is steadily increasing, and the third is diminishing.

There are now (1870) enrolled one hundred and forty-one students, of whom twenty-eight are graduates, one hundred and one are candidates, and twelve are pursuing partial courses. They come from twenty-two different States. The tuition charges are one hundred and fifty dollars per year.

For the advanced and special students, courses of study are arranged from time to time according to their requirements. All others are obliged to pass the entrance examination, which includes algebra, geometry, and trigonometry, Latin, (sufficient to read a classical author,) and the usual branches of a good English education. During the first year, the curriculum includes analytical and descriptive geometry, surveying and drawing, physics, chemistry and botany, German and English. At its close each student elects one of seven special courses which he will follow. These courses are:

1. Chemistry and mineralogy; 2. Civil engineering; 3. Mechanics; 4. Mining and metallurgy; 5. Agriculture; 6. Natural history and geology; 7. Select course of science and literature.

Each of them has a prescribed succession of studies, largely, but not wholly, professional, and extending through two years more. The particulars of these courses can be learned in the annual catalogues.

VI. MODERN PROFESSIONS FOR WHICH INSTRUCTION IS PROVIDED.—While the catalogue announces seven chief "sections" of the school, the present arrangements for instruction have reference to the requirements of a still more varied company of students. There are three marked subdivisions of the branches of technical instruction, as here provided,

namely: 1. Chemistry and physics; 2. Mathematics and engineering; 3. Natural history.

There is also provisions for the study of modern languages, geography, history, and political economy, to which the students are required to give more or less attention. In each of the groups above mentioned there is great freedom of choice respecting the general direction which a student may take; but, when his decision is made, there is a definite and prescribed curriculum to which he is restricted. In the combinations of the different classes, students are received who desire to qualify themselves for such professions and occupations as the following:

1. Men of science—either as professors, teachers, explorers, investigators, amateurs, &c.

2. Chemists—with reference to agriculture, manufactures, and many commercial pursuits.

3. Metallurgists and assayers.

4. Civil engineers—with reference to the construction of roads and bridges, aqueducts, reservoirs, drainage systems, and public works in general.

5. Mechanical engineers—with reference to the superintendence of manufactories, the invention and construction of machinery, the application of steam, &c.

6. Mining engineers—with reference to the development of mineral wealth, the superintendence of mines, &c.

7. Agriculturists—acquainted with the constitution of the soil, the laws of animal and vegetable life, the experience of other nations, &c.

8. Naturalists—either in the direction of zoology, botany, mineralogy, or geology.

9. Physicians and sanitary advisers—not as pursuing here medical and surgical studies, (which must be afterward taken up in the medical schools,) but in preparation for the latter by studies in physics, chemistry, botany, comparative anatomy, &c.

10. Manufacturers and superintendents of manufactories.

11. Besides all these specialists, students are received who desire, by a course of training chiefly mathematical and scientific, but likewise including linguistic and historical studies, to prepare themselves for higher studies in science, or for business, or for other professions not specified above. This course has been here selected by young men designing to become clergymen, lawyers, editors, teachers, &c.

LAWRENCE SCIENTIFIC SCHOOL.

The courses of instruction in the Lawrence Scientific School, connected with Harvard College, Cambridge, Massachusetts, embrace: chemistry, zoology and geology, engineering, botany, comparative anatomy, mathematics, and mineralogy.

"Candidates for admisssion must have attained the age of eighteen years, have received a good common English education, and be qualified

to pursue to advantage the courses of study to which they propose to give their attention."

The course in chemistry includes instruction in theoretical and experimental chemistry, and systematic and quantitative analysis, together with a solution of problems of research in experimental science, and in the applications of science to the arts.

The instruction in the department of zoology and geology consists of courses of lectures on zoology, embracing the fundamental principles of the classification of animals, as founded upon structure and embryonic development, and illustrating their natural affinities, habits, geographical distribution, and the relations that exist between the living and extinct races; and of courses on geology, both theoretical and practical, with occasional laboratory lessons in the methods of studying nature.

The mathematical course embraces instruction in the higher mathematics, especially in analytical and celestial mechanics.

Botany is taught by practical lessons in both the structural and systematic divisions of that science.

Comparative anatomy is taught by lectures and by special lessons in the anatomical laboratory.

The course in mineralogy embraces theoretical crystallography, the determination and drawing of crystals, the study of the physical properties of minerals, and the determination of mineral species, and consists of lectures and practical exercises in the laboratory.

Through the munificent endowments granted by several noble patrons of science in Massachusetts, as well as by means of the practical services rendered by the distinguished professors—Agassiz, Wyman, Gray, and others—the Lawrence Scientific School is already provided with museums and laboratories of much value, and the opening future gives promise of yet more rapid development and of still greater usefulness. What it greatly lacks, at present, is an increase of endowment to enable it to add to its working force and to diminish the cost of instruction.

Standing very nearly on the same basis with these schools are the Chandler Scientific School, connected with Brown University, (at Providence, Rhode Island;) the scientific courses in the Universitiy of Michigan, (at Ann Arbor, Michigan,) and the scientific courses and departments in several other prominent institutions of the country. There is a growing tendency to meet the demands of the times by the creation of such departments in all the colleges and other literary schools of the United States.

FACULTIES OF PHILOSOPHY IN EUROPEAN UNIVERSITIES.

In like manner more or less of science is taught in what are known as the *faculties* of *philosophy* belonging to the universities of most European states—in some of them much more extensive and thorough individual courses being given than in our own country. But, so far as I have observed, the only close parallels to the American scientific schools,

above referred to, are presented by the leading universities of Belgium, Holland, Denmark, and Italy, and by the sixteen academies of France.

FRANCE.

In the French *Faculté des Sciences* the amount of instruction given varies somewhat with the locality of the academy to which the particular faculty belongs; though in the case of all, except the faculty belonging to the Academy of Paris, there are about the following professorships, to wit: of pure mathematics, of mathematics applied, of physics, of mineralogy and geology, of botany, of zoology and physiology, and of chemistry. In some cases the branches here indicated as being united under one professorship are assigned to two professors, and in others some of those separately named are united as one.

There being demand at Paris for a more extensive course, the number of branches taught and of professors is much greater—sufficiently so to constitute it the highest and most complete faculty of science in the world; while the corps of professors includes many of the most distinguished names known to the science of the present age.

The professorships in this institution—*Faculté des Sciences, à la Sorbonne*—are as follows: physical astronomy, mathematical astronomy, superior algebra, superior geometry, differential and integral calculus, calculus of probabilities and mathematical physics, (two professors, assisted,) physics, (two professors,) rational mechanics, physical mechanics, (two professors,) chemistry, (three professors,) mineralogy, geology, botany, general physiology, zoology, anatomy and physiology, anatomy, comparative physiology and zoology.

Besides the regular professors, upon whom the responsibility rests of giving the above courses of instruction, there are honorary professors and private lecturers, who further add to the instructional force.

The diplomas accorded to students who have completed the various courses of scientific study in the academy are of four general grades: for the diploma of bachelor of sciences (*bachelier ès sciences complet*) the candidate must be at least sixteen years of age, and satisfactorily pass both a written and an oral examination. The written proof of fitness consists (first) of a thesis upon a mathematical subject and a physical subject; and (second) of a Latin translation, if the candidate does not present the diploma of bachelor of letters. If both of these ordeals are passed to the satisfaction of the examiners, the candidate is then admitted to the oral examinations; which bear upon the elementary mathematics taught in the second year of the lyceum course, and upon the mathematical, physical, and chemical sciences. Candidates not possessing the diploma of *bachelier ès lettres* are also examined in some living language as well as upon geography, history, and philosophy. The diploma fee is one hundred francs.

The diploma of bachelor of sciences, limited, (*restreint*,) is designed for medical students, as the lowest degree with which they can be admitted

to an examination in medicine for the doctorate, and differs in no respect, except that the amount of knowledge of mathematical science demanded is less than in the other case.

The diploma of licentiate (*de licencié ès sciences*) is next in rank above that of bachelor. In order to be admitted to an examination for this degree, the applicant must produce the diploma of bachelor of science, obtained within one year, and (unless prevented by the performance of functions in some department of public instruction, in which case this rule may be waived) must have taken at least four courses prescribed in the faculty.

The licenses are of three kinds—for the mathematical sciences, for physical science, and for the natural sciences—and the diplomas accord with the department of science, in which an examination is passed by the candidate.

The examinations in all cases are, first, written; second, practical; and third, oral; and the candidate is only admitted to the second and third after having satisfactorily passed the preceding trials. The practical examinations take place in one of the cabinets or one of the laboratories of the faculties. The fees, all told, are 140 francs.

The diploma of doctor of science is also divisible, so to speak, into three degrees, namely, that of doctor of the mathematical sciences, doctor of physical science, and doctor of natural science. In order to obtain either of these degrees—and the candidate may obtain them all in one, if possessed of the requisite qualifications—it is necessary to be provided with the diploma of licentiate, and to submit and defend two theses to the approval of the examiners. The fees in this case are 140 francs.

But this faculty of science is by no means the only great school of science of which the capital of the French empire may boast. There are at least two others hardly less remarkable, either for the number and extent of their courses of scientific study or the learning and world-wide distinction of their professors.

The *Musée d'Histoire Naturelle* is one of these two. Located in the *Jardin des Plantes*, where its great museum collections, and its many laboratories, amphitheaters, and auditoriums are surrounded by magnificent botanical gardens, conservatories, and important collections of living animals, it dwells in the very atmosphere of science, and possesses attractions almost strong enough to draw even the worldling from his unsatisfying pursuits and compel him to the enthusiastic study of nature.

Directed jointly by those distinguished savans MM. Chevreul and Milne-Edwards, it has gathered to its chairs of instruction some of the most celebrated naturalists of the empire, and is now, as it long has been, the leading natural history school of Europe.

The following are the titles of distinct administrative professorships: comparative physiology; comparative anatomy; the anatomy and natural history of man; zoology—mammals and birds; zoology—reptiles and fishes; zoology—insects, the crustacea and arachnida; zoology—anne-

lides, mollusks, and zoophytes; botany and vegetable physiology; geology; mineralogy; paleontology; physics applied to natural history; vegetable physics; chemistry applied to organic bodies; chemistry applied to inorganic bodies.

The other institution to which allusion is made above, as furnishing instruction in science of a high character, and to a liberal extent, is the *Collége Impérial de France*. This great institution has already been noticed in the chapter on schools of letters, to which class it rather more properly belongs; but it is also proper to mention it here, since, in addition to its twenty-one chairs of a literary character, it also includes the following eleven chairs maintained purely in the interest of science, to wit: *Mécanique céleste*, mathematics, general and mathematical physics, (two professors,) general and experimental physics, (two professors,) chemistry, organic chemistry, natural history of inorganic bodies, (two professors,) and comparative embryology.

Grouping together these several purely scientific schools and portions of mixed schools, including numerous scientific chairs, and adding to them the other scientific institutions of Paris, such as the Imperial School of Charts; the Imperial Observatory, with its astronomers, headed by the illustrious M. Le Verrier, and their ten adjuncts and aids; the Bureau of Longitudes, and, crowning all, the great Academy of Sciences, as their guide and inspiration, and we have a brilliant cluster of scientific schools and agencies such as is presented by no other city or country in the world.

ITALY.

In Italy a faculty of mathematical, physical, and natural science (*facoltà di scienze fisiche, mathematiche e naturali*) is found in nearly all the royal, and in three of the free, universities. All such as are connected with the royal universities are subjected by royal decree to the following general regulations, to wit:

The candidate for admission as a student must (first) prove that he has passed the examination required for a licentiate in some government lyceum, or in the physical and mathematical section of one of the technical institutes of the kingdom; and (second) pass an examination before the board of the faculty, bearing upon the Italian and Latin languages and literatures, geometry, trigonometry, and algebra.

The diplomas attainable at the end of the four years' course of study are of four kinds, viz: the diploma in pure mathematics, the diploma in physico-mathematical science, the diploma in physico-chemical science, and the diploma in natural history. The degree in each case is that of doctor.

The studies prescribed, the mastery of which is a prerequisite to graduation, are—

For the diploma in the department of *pure mathematics:*

First year. Algebra, complementary; analytical geometry; inorganic chemistry; design.

Second year. Differential and integral calculus; descriptive geometry; design.

Third year. Rational mechanics; theoretical geodesy; physics; design.

Fourth year. Analytical and higher geometry; physical mathematics; astronomy, and *mécanique céleste.*

For the diploma in the department of *physico-mathematical science:*

First year. Algebra, complementary; physics; inorganic chemistry; exercises in physics.

Second year. Differential and integral calculus; physics; organic chemistry; exercises in chemistry.

Third year. Rational mechanics; analysis and higher geometry; mineralogy and geology; exercises in practical physics.

Fourth year. Astronomy and *mécanique céleste;* mathematical physics; practical exercises in physics; practical exercises in astronomy and geodesy.

For the diploma in *physico-chemical science:*

First year. Physics; analytical geometry; botany; exercises in physics.

Second year. Inorganic chemistry; physics; mineralogy and geology; exercises in chemistry and in crystallography.

Third year. Organic chemistry; zoology; comparative anatomy; physiology; exercises in chemistry.

Fourth year. Inorganic chemistry; organic chemistry; exercises in chemistry.

For the diploma in *natural history:*

First year. Physics; inorganic chemistry; human anatomy; practical exercises in chemistry.

Second year. Physics; organic chemistry; mineralogy and geology; practical exercises in mineralogy and geology.

Third year. Physiology; botany; zoology; comparative anatomy; practical exercises in botany.

Fourth year. Botany; zoology; comparative anatomy; mineralogy and geology; practical exercises in zoology and comparative anatomy; geological and botanical excursions.

It is forbidden to take, at the same time, the studies that lead to two diplomas; but a graduate from one of the three last-named scientific courses is allowed, at the end of two years in either of the other two of the three, to present himself for examination as a candidate for the diploma in that course. And, in every one of the four courses, the student who satisfactorily passes the examinations at the end of the first and second years receives the degree of bachelor. So, likewise, one may receive the title of licentiate at the end of the third year, if all the several examinations have been satisfactorily passed.

The price of tuition in any of the scientific courses above mentioned for the entire term of four years is 240 lire, (less than $40;) for each of the four years, 60 lire.

Each of these faculties or schools in the universities has its own college or board of regents, with its president and secretary; and each of the four divisions is presided over by an executive, known as president.

The number of professors varies, of course, for different locations, but in no case have I found less than seventeen regular professors; and in some cases, as at Milan, Turin, Genoa, Naples, Florence, Bologna, for example, the number is from twenty-five to thirty-five, besides numerous honorary, emeritus, and independent professors, who give lectures bearing upon the subjects taught.

It is hardly necessary to add that these schools are well provided with the means of illustration; the fact of their connection with some of the oldest and best furnished universities in Europe being sufficient guarantee on this point. In some instances, no less a number than twenty distinct and immense collections, laboratories, libraries, observatories, &c., being all at their service.

DENMARK, HOLLAND, AND BELGIUM.

In the Danish University, at Copenhagen, there is a faculty of mathematical and natural science, (independent of the polytechnic school, of which some account is given under its appropriate head,) in which the instruction is exclusively scientific, embracing courses in the following branches, to wit: mineralogy and geology, special geology of Denmark, general and analytical chemistry, zoology, general physics, chemical physics, astronomy and the history of astronomy, higher mathematics, general botany, with special botany of Denmark, and botanical excursions.

The instruction is by eight professors, with the aid of all the material facilities afforded by the university.

Holland also presents the same feature in her leading institutions of learning. For although the faculty of the sciences in the Dutch universities, as, for instance, in the old University of Leyden, bears the title of "faculty of mathematics and physics," there are really given in this school very thorough and amply illustrated courses of instruction in zoology and anatomy, including comparative anatomy, general chemistry, chemistry in its practical relations, geology, morphology, physiology, botany, &c., in addition to the usual courses in the higher pure and applied mathematics. The terms of admission are the same and the honors of graduation equal to those for the other faculties.

In Belgium the departments of science bear the same title as in France, (*faculté des sciences*,) and the branches of study are very nearly the same. The division of the sciences into courses is two-fold, instead of four-fold, as in Italy, viz: into the course in the natural sciences, and the physical and mathematical sciences. The honors conferred in both of these divisions are of two grades—the title of candidate and the title of doctor. The first is conferred in the natural science division, after a successful examination in elements of chemistry, inorganic and organic,

experimental physics, elements of botany and the physiology of plants, zoology, mineralogy, psychology.

The examination requisite to the title of candidate in the physical and mathematical sciences is in higher algebra; analytical geometry complete, descriptive geometry, differential and integral calculus, as far as and including quadratures, experimental physics, elementary statics, mineralogy, psychology.

The title of doctor in the division of natural sciences is conferred upon such as have already received the honors of candidate, after a searching and satisfactory examination in chemistry, inorganic and organic, comparative anatomy, comparative physiology, vegetable anatomy and physiology, geography of plants and natural families of plants, mineralogy, geology, physical astronomy.

The branches in which a candidate must be examined for the degree of doctor in the physical and mathematical sciences are, analysis, analytical mechanics, mathematical physics, astronomy, and calculation of probabilities.

AUSTRIA, PRUSSIA, AND OTHER GERMAN STATES.

Austria, Prussia, and the other German states, supply numerous important courses of scientific instruction in the philosophical faculties of all their great universities; and the same is true, to a less extent, of all the other continental countries, but none of them either possess distinct and independent schools of science, or university faculties of science, or furnish other scientific instruction than is given by individual professors in the faculties of philosophy, and in their real, technical, and polytechnic schools. But there the aggregate amount of scientific instruction thus furnished is very great, and is constantly increasing by means of the great number of the institutions just named that are annually founded, and by reason of the growing tendency of the philosophical faculties to strengthen themselves on the scientific side. Indeed, it is hardly over-stating the case to say, that the spirit of science is fast becoming rife everywhere on the continent, and seems destined soon to become the dominant spirit in all parts of the Old World.

GREAT BRITAIN.

Great Britain has long been an exception to this enthusiasm for science; the Royal School of Mines, at London; the Royal College of Science, at Dublin, and a few scattering chairs of chemistry and natural history in the universities and some of the other high-schools, having long presented the sum total of what the English nation was doing in the way of diffusing a knowledge of science in the United Kingdom. But, at last, this slowest of the nations to follow the lead of even its own pioneers in the way of progress, has been aroused to an apprehension of the necessity that exists for doing something in this direction, as the alternative of an early and final loss of its supremacy in every branch

of industry to which the sciences are more especially applicable; and, through the agency of its new Science and Art Department of the Committee of Council on Education, gives promise of a revolution in its educational affairs.

It is true that this movement is, at present, pretty much confined to elementary teachings in the lower schools of the principal towns and cities, and has been initiated with a direct view to the applications of industry; but it is no less certain that the bits of leaven thus distributed over the kingdom will soon have their influence upon the whole mass of the people, and thus, at a very early day, effect important reformations in all the higher institutions.

The plan adopted by the Science and Art Department is to induce the opening of classes for science in as many of the schools as possible, by offers of so much government pay for a given amount of scientific instruction in schools of both elementary and secondary grade, and to encourage the ambition of pupils by the offer of a definite number of royal prizes in the form of medals, entitling those who receive them to free scholarships, tenable for from one to three years, in the higher scientific schools at London and Dublin. From the minutes of the department I gather the following more definite and highly interesting information on this subject.

Besides the provision for a large amount of technical and professional instruction—with which I am not now dealing—aid is given to instruction in plane and solid geometry, elementary and higher mathematics, theoretical mechanics, acoustics, light and heat, magnetism and electricity, inorganic chemistry, organic chemistry, geology, mineralogy, animal physiology, zoology, vegetable physiology and botany, and in systematic botany.

In order to place any school or class in the way of receiving aid, it is necessary that a committee, consisting of at least five persons, should undertake to perform the requisite duties of superintendence.

The aid consists of, first, payments to certificated teachers on the results of instruction as tested by examinations held simultaneously throughout the kingdom; second, of medals and prizes to the successful students; third, of grants to the school in aid of the purchase of apparatus; and, fourth, of royal "exhibitions" and free admissions to the Royal School of Mines, in London, and the Royal College of Science, in Dublin.

The payments to the teachers vary from £1 to £5, according to the class in which the student is placed. There are five classes, the fifth being the lowest. The payments are only made for the instruction of students of the artisan or weekly wages class, and those whose incomes are less than £100 per annum. The teacher, to be qualified to earn payment on results, must have taken a first or second class certificate, or be possessed of a university degree; though it is not necessary to enable a class to be examined and obtain prizes that the teacher should be certi-

ficated, as under the supervision of a satisfactory committee any class or single student can be examined, however taught.

Prizes which, with some few restrictions, are open to all students, are given to such as obtain a first, second, or third class award. To the best in each subject are given a gold, a silver, and two bronze medals. All who receive gold medals are granted free admission at either of the royal institutions above named. Besides these prizes there are given in competition at the annual examinations (which are held in May) six royal "exhibitions" of the value of £50 each—three insuring admission to the Royal School of Mines, and three to the Royal College of Science.

In addition to the foregoing, for the higher grade of schools, the minute of December, 1867, provides for two forms of scholarship in connection with elementary schools, whether receiving state aid as such or not. The first is known as the "elementary school scholarship;" the amount being £5 granted to the managers of any elementary school for the support of a deserving pupil, if they undertake to support him for a year and subscribe £5 for that purpose. The second, a more advanced scholarship, and known as the "science and art scholarship," amounts to £10, and is granted in aid of the support, for one year, of such deserving pupils as at the annual examinations shall have won at least a third-class award. In both of these cases the student must be from twelve to sixteen years of age; the number of "exhibitions" dispensed by the department is not to be greater than one for every one hundred students in any given school, and the selection must be by competition. Lastly, this same minute provides for local "exhibitions" in aid of students of advanced scientific attainments, who may desire to complete their scientific education at some higher school. The amount to be granted is £25 per annum for one, two, or three years, on the conditions that the locality shall raise a like amount by voluntary subscription; that the "exhibition" shall be awarded in competition, (the branches for which may be determined by the locality,) and that the student shall pursue his studies satisfactorily. Should the student thus aided select as the place of his higher studies either of the scientific institutions above mentioned, it is further resolved that all fees shall be remitted.

In evidence of the interest and activity awakened by this general movement of the science department, it may be stated that the number of "science schools" has increased from 9, in 1860, to 300, in 1868; and the number of pupils in annual attendance, from 500, in 1860, to 15,010, at the close of 1868.[1] The number of localities in which the schools had been established, up to the latest date mentioned, was 261. These are noble results, at once reflecting credit upon the wise and liberal action

[1] The latest returns, March, 1869, show that the number of science schools had increased to 514; of these, 354 were in England, 28 in Scotland, and 132 in Ireland. In these schools there were 1,448 classes, in which about 21,000 students were receiving instruction. These returns are irrespective of navigation schools, which do not send up pupils for examination, and therefore receive no payments on results.

of the department, and awakening great hopes for the future of scientific education in Great Britain.

The impulse lately received by science, in both the Old and the New World, is such that nothing can now effectually hinder its progress. The great question of the present, therefore, is how to give to the movement the most judicious aid and direction, so as to make it yield the largest possible results as the pioneer of mankind in rising to a higher civilization. There must be no jealousy on the part of the world of letters. The highest civilization cannot be without the culture that comes of a knowledge of language, literature, and philosophy. But while we strive directly to extend the advantages which the study of these is now only able at the best to bring to the few, let us bid an intelligent and hearty God-speed to this growing giant of science, whose mission it is to conquer the material forces, and thus provide a broad and substantial foundation upon which a vastly larger number than at present may enjoy that complete culture essential to the highest individual and social condition of man.

III.—SCHOOLS OF ART.

ART SCHOOLS REPRESENTED AT THE EXPOSITION.

The latest advances in the progress of art education were illustrated at the Exposition of 1867 by the most remarkable collection of works of art, as the product of school labor from school instruction, ever made; and this, let it be distinctly understood, at an industrial exhibition where industries, new and old, were the main exhibits. If the stern, physical necessities that press around man's life of toil found illustration in almost countless forms of ingenuity and handicraft, the possible amelioration of these severities was set forth by only less numerous displays in that wide range of art from which the poorest might select something befitting his means. The artistic exhibits of this class were not the outgrowth of genius, supposed to have power to work its way unaided, but of the instruction that had developed and directed such genius and talent as are the more common gifts of nature.

The countries represented by these works were France, Italy, Germany, Austria, Russia, Spain, Switzerland, England, and Brazil. The schools represented were mostly municipal establishments, and among the noted ones those of Paris, Nuremberg, Munich, Venice, Vienna, St. Petersburg, Barcelona, and London. Instruction in schools of this class is very generally gratuitous, and open to applicants from all classes showing an aptitude for it.

Of those art schools that rise above the municipal, several of the above-named countries have one central institution which is of state or royal patronage, and devoted to the higher education of such as give promise of becoming masters of the practice or teaching of art.

Of these, the "École des Beaux-arts," of Paris, is a leading one. It

is under the direction of the minister of the house of the Emperor and of the fine arts, and has for its object instructions in painting, sculpture, architecture, and engraving on metals and on precious stones. A high degree of proficiency in all that is preparatory to these studies—as in drawing, designing, modeling, &c.—and a fluent use of the French language, are required for admission to either the general or special instruction, which, to the limit of accommodations, is furnished in the ateliers of the several professors. The ages of admission range from fifteen to twenty-five; instruction is gratuitous; and foreign pupils are admitted on the special permit of the minister.

We are so accustomed to think that such things are to be expected of old and aristocratic governments, and that the rest of the world may as well go to them for such privileges as they offer, that it may be profitable to turn from this pride of the Old to a rising city of the New World.

ACADEMY OF THE FINE ARTS, BRAZIL.

At Rio Janeiro, Brazil, there is an "academy of the fine arts," with a course of instruction divided into sections as follows:

The first section comprises classes in geometric design, ornamental design, and civil architecture.

The second section, classes in ornamental sculpture, engraving of medals and of precious stones, and statuary.

The third section, classes in sketching of figures, landscapes, flowers and animals, historical painting, and living models.

The fourth section, the chairs of application of mathematical principles, anatomy and physiology of the passions, history of the fine arts, æsthetics, and archæology.

The fifth section is formed by the conservatory of music.

Neither the effective (working professors) nor the honorary ones, the first appointed by the government and the last by the academic body, can accept the positions without presenting to the academy one of their works, which thereafter remains the property of the institution. From this it will be seen that the professors must have experience and skill in art. An honorary professor may be called upon to fill the temporary vacancy of a working one, if deemed essential to the interest of the institution by the general director.

In 1866 the several sections of this academy numbered 216 students, 48 of whom obtained prizes at the annual exhibition, at which there must be displayed the entire work of all the pupils for the year. Every two years there is a general exhibition of the works, for that time, of the academy and of the private studios of artists throughout the provinces, at which both native and foreign artists may compete. At these exhibits there is a prize extraordinary for the most eminent Brazilian pupil, which prize consists in pensioning the artist to the extent of six years' study in Europe, if a historical painter, sculptor, or architect; and for a four years' study, if an engraver or landscape painter.

Instruction in all the departments is gratuitous, the conservatory of music having a special director, edifice, regulations, &c.; and the entire expense to the government being near $26,000 per annum.

This, as an example of what may be done for national art at a great distance from art centers, is certainly very creditable.

ART EDUCATION IN MUNICH.

From the facilities there found in other departments of superior education, the presence of great masters, and rare collections for each, it is at Munich that art education is most widely sought, there being at this point scarcely less than one thousand students at any time. The Royal Academy of the Fine Arts, which was founded in the first years of the present century, and which has had an uninterrupted life of prosperity since its new constitution and endowment by the noble Louis, in 1846, is both a society of artists and a school of art.

Instruction in this school includes historical painting, sculpture, architecture, engraving, the history of art, anatomy, perspective, descriptive geometry, and shading. While the antiques are much favored as studies for drawing, great attention is given to models from nature. Instruction in historical painting is given in four distinct schools, each having its professor, as have the separate schools of sculpture, architecture, and engraving. There are regular lectures upon the history of ancient and modern art, on anatomy, and all branches of related knowledge, by men eminent in these departments.

The full course requires six years, though pupils attaining the required proficiency may leave at earlier periods; no one being admitted who has not previously acquired great facility in drawing and a fair scholastic education, and then on a probation of six months before installation as pupil of the academy. Instruction is gratuitous to both natives and foreigners upon the same terms of qualification.

ART SCHOOLS IN FRANCE.

Between the international exhibitions held at London, 1851, and at Paris, 1855, an inquiry was instituted in France, through a commission of distinguished gentlemen, as to the means of promoting the artistic industrial resources of the common people. The report of M. Ravaisson to the minister of public instruction referred this great interest directly to their system of popular education, and set forth, in most convincing terms, the essentiality of drawing as an element of the most indispensable value in early training. He took the ground, moreover, that drawing should be taught as the basis of pure art, leaving it free to develop into the industrial or the fine arts, as circumstances and taste directed. To this end he urged that the models from which the very beginner commences to copy should be those that are perfect of their kind, but simple in their parts—as the head in such detail as would insure the greatest success in later combination of the whole. This

report is full of suggestions as to the feasibility of advancing all forms of industry by the same elementary instructions that prepare for the highest art, and for introducing it to the reach of all who care for such education. At that time the public treasury was supporting a higher grade of art-education at an annual expense of between $400,000 and $500,000; and though the report referred to was made by decree of the minister of education the basis of such additions as it recommended to the scheme of public instruction, it is not until some years later that there are reliable statistics of its adoption in the communal or most primary schools.

Between 1865 and 1867, 180 of these schools, in the department of the Seine and city of Paris, were instructing classes of mere children in the elements of drawing and design, with all the facilities that several previous years of preparation had secured. In 1863 a municipal appropriation of 30,000 francs had been made for this preparation, which consisted in opening competitive examinations for qualified instructors, who should be ranked as professors, and be, for what they undertook to teach, masters and mistresses indeed. The carefulness of scrutiny to which the aspirant for this new place in the public school was subjected may be inferred from the statement that, out of 179 candidates, but 27 were accepted as qualified to instruct in ornamental, and 13 in geometric design. In addition to the teachers provided at such pains and delay, the commission in charge of this enterprise had procured an overhauling of all such models as had been in use in schools of design, throwing out, at the decision of the most severe criticism, all such as were not of superior value, remodeling and assorting and adding to, until, between the dates mentioned when instruction actually commenced in these schools, 35,000 models, embracing busts, engravings, photographs, bas-reliefs, and sketches, selected from the entire range of Greek, Roman, and modern art, had been distributed. These models, &c., had been classified so that they would, in turn, pass the circuit of all the schools, as of the evening classes opened in connection with these daily instructions for the benefit of such adults as sought their advantage.

The result of this movement that is intended to extend to the communal schools of the empire as fast as it can be done without lowering its standard, as of the frequent inspection of the mode of instruction and the work done by pupils, has been declared more than satisfactory. Material proof of this is found in the fact that, whereas in 1863 the municipal appropriation of 30,000 francs was deemed sufficient to inaugurate the measure, the appropriation of but two years after its first test, that of 1867, was 312,000 francs to enlarge and carry it to still further successes.

Art properly taught has not only an educational value for itself, but it is a valuable accessory to school discipline, relieving the monotony of the routine of ordinary school studies. The absence of art instruction in common schools is a serious defect. The addition of such instruction

would be most salutary, and tend to repress the increasing restlessness of our population.

It may be justifiable to console ourselves, on behalf of our country and of the world, by the reflection that the art education has been longest delayed, because it has been supposed to touch only that social development of a people last reached; and because, old as is the oldest country in comparative history, all are yet new in the work of understanding the complete needs of man.

SPECIAL EDUCATION.

CHAPTER VI.

INDUSTRIAL SCHOOLS.

SCHOOLS OF THE ARTS AND TRADES—RUSSIAN SCHOOL—FRENCH SCHOOLS, AND THE COURSES OF STUDY—GERMANY—SCHOOLS IN OTHER COUNTRIES OF EUROPE—ASSOCIATION PHILOTECHNIQUE OF PARIS—MECHANICS' ASSOCIATIONS IN THE UNITED STATES—SCHOOLS OF APPLIED ART IN EUROPE—RAPID INCREASE IN GREAT BRITAIN—SCIENCE AND ART DEPARTMENT—SOUTH KENSINGTON MUSEUM—WURTEMBERG—NECESSITY FOR TEACHING THE PRACTICAL APPLICATIONS OF ART IN THE UNITED STATES.

It was natural that the important scientific discoveries which rapidly followed the introduction of the Baconian philosophy should have given origin to a class of schools specially designed to furnish instruction in the mathematical, physical, and natural sciences, whose potency for the advancement of the arts of civilization soon became unquestionable. Speculative philosophy, dogmatically asserting itself and promising grand results that never came, began, so soon as the foundations of science were laid, to lose its hold upon the best minds of the age; and not a few of the most culture came to see that scholasticism was not of itself sufficient to meet the practical needs of mankind, and seriously to question whether it was best to require every ambitious lover of knowledge to follow in the old beaten path, regardless of his purposes or his necessities.

One of the early fruits of the new philosophy was the establishment of the real schools as divergents of the gymnasia, some account of which has been given, Chapter IV. But the real schools were rather designed to fit a certain class of youth, presumed to be wanting either in ability or in inclination to pursue the classics, for the ordinary general duties and business of life. The idea that the engineer, the miner, the mechanic, and the farmer required, for the most successful practice of their several occupations, a training and study akin to, but very different from, the preparation which had for centuries been required of those who would practice the learned professions—this idea came later. But it did at last come, and in its train a great number and variety of schools of an entirely new class—schools scientific, schools technical and polytechnical, schools industrial and professional, institutions whose name already is legion, and yet whose number rapidly increases in all lands.

Hundreds of these schools were in some form represented in Classes 89 and 90 of the Exposition, and hence required attention. But if they

had not been represented, their vast importance to the world, and the interest awakened in them in all civilized countries, would demand for them a large share of consideration.

I.—SCHOOLS OF THE ARTS AND TRADES.

To the careful observer no feature of the Exposition was more instructive than the direct relation discoverable between the representative exhibits of a large class of industrial and technical schools, and the products of manufacture displayed in several departments, designed merely to illustrate the progress of industry. It was not the relation of harmonious development merely, but, as between the schools themselves and those industrial departments referred to, it was manifestly the relation of cause to effect. For nothing could be plainer than that in proportion as such schools had been established and fostered by a country, that country had made progress in those particular branches of manufacture for whose advancement they were originally established.

Thus, as early as the latter part of the last century, schools created for the purpose of furthering development of the arts began to spring up in many portions of France and Belgium, and in some other countries—schools for instruction in the arts of designing, engraving, coloring, dyeing, silk and ribbon weaving, lace-making; of the making of horological instruments of various kinds; stone-cutting and general carving; of manufacturing the most delicate patterns and elegant forms of glassware; of working the metals, both useful and precious, into nearly every variety of form, for the consumption of the most refined and cultivated nations—schools, likewise, of various grades for instruction in the principles and practice of the more complex and comprehensive arts of mining, engineering, agriculture, &c. To-day it is undeniable that, in nearly all the branches of industry named, in every one, I will venture to say, for improvement in which special educational effort has been made, those countries are the acknowledged leaders of all others.

These remarks are eminently true in their application to the influence of schools of design in which France, more than any other country, abounds, and from which, in the whole range of artistic manufactures, all the other nations have so long been borrowers.

And yet France affords scarcely a better illustration of the general remark above made than England, the clumsy attempts of whose workers in glass and fine pottery, as well as in the precious metals and in certain kinds of figured prints, silks, &c., even as late as the first exhibition, were less remarkable as competitive failures than has been her rapid progress in all those branches since that period; when, being fairly aroused to a realizing sense of the causes of the superiority of France in nearly all the finer arts of manufacture, the British government began in earnest to found and encourage the establishment of similar schools in various portions of the United Kingdom.

Of the number, distribution, and character of schools of lower grade

for the improvement of the arts and trades, I must content myself with the general statement that, in France and Belgium, where, as a class, they may be said to have originated; and in Switzerland, Holland, and all the German states, into which they spread, or in which they sprung up almost cotemporaneously, they are numbered in the aggregate by thousands—some of them extensive enough to accommodate pupils by the hundred, and exerting a very marked and important influence upon large districts of country. In the countries first named they occur in some form in nearly every large town; while in some of the larger cities they are even numbered by the dozen.

Many of the schools in question are for the instruction and practical training of youths—boys or girls, or both—in some single branch of manufacture. Many are, likewise, for the practical education of adults in those applications of mathematics, mechanics, and chemistry, a knowledge of which is essential to one or more kinds of industry. Others embrace a wider range of scientific study, and are open alike to both youth and adults above a minimum age.

As to support, some are maintained wholly by the government; others receive only a moderate amount of state aid; a large number—especially of such as are more strictly industrial, and are confined to individual arts—are private institutions, managed on the sole responsibility of their founders; while some of the most important and most flourishing, under the general title of apprentice schools—being designed to induct boys and girls between twelve and fifteen years into the best methods employed in various trades, at the same time that they are taught the principles that underlie those occupations, and thus, at the expiration of two or three years of study and labor combined, they are prepared to enter, with greater advantage, as regular apprentices into the practical study of their chosen pursuits—are established, directed, and supported by philanthropic societies.

Of the multitude of these primary technical schools at present found in all European countries, none are more interesting perhaps than those which have been established within the few past years in Belgium, as at Roulers, Ghent, Ath, Wacken, Courtray, Deerlyk, and many other points. From being foremost in the spinning and weaving of flax, (employing, it is said, no less than 220,000 spinners and 57,000 weavers as late as 1830,) Flanders was reduced, by the introduction into other countries of labor-saving machinery, which has characterized more recent times, to a condition of actual distress. Stimulated by the necessity to do something to rescue this branch of its industry, and at the same time ameliorate the condition of the poor working-people of Flanders devoted to this and other branches of industry, the government of Belgium conceived the idea of establishing, at certain points, industrial establishments in which, at the heads of the several departments, should be placed skilled and educated foremen, while the youths of their respective neighborhoods should be allured from the streets and the haunts of vice by pay for

labor carefully performed under this wise and kindly supervision, and, at the same time, instructed by competent teachers each day, for one, two, or three hours, first in the rudiments of learning, and then, in connection with their work, in the scientific principles involved in their several trades.

By this means great numbers, who without stringent compulsory regulations would grow up in utter ignorance and enter into the devious paths of wickedness, are now being at once technically, intellectually, and morally trained for careers of usefulness; while, by means of the frequent conferences required of the heads of practical departments in the various schools of the same general district, for the discussion of methods and the diffusion of a knowledge of the latest improvements, much progress has also been made by the industry of the whole country.

Schools for the technical education of girls, and even of adult females—of whom the number devoted to the many operations of spinning, weaving, lace-making, embroidering, &c., is so great in Belgium—have likewise been established within the past five years in many parts of this busy little kingdom.

Were I to attempt an account even of the more interesting examples of this class of schools, as found in the different countries, this single chapter would swell to a volume; for such interesting examples are almost as numerous as the manufacturing towns of Europe.

As a means of improving the social condition of individuals and populations, by affording the means of profitable employment to thousands who would otherwise suffer from want, they are hardly less interesting than as potent agencies for the advancement of a multitude of handicrafts, in the perfection of which the whole world is interested.

Schools for technical instruction established, directed, and sustained by voluntary associations on philanthropic grounds, found their most interesting illustrations at the Exposition in the contributions made by various institutions of France and Holland; among which, those located at Strasbourg, Mulhouse, and Amsterdam, possess peculiar interest as showing in a very satisfactory manner their ameliorating influence upon the industrial condition of localities.

Of schools of this class we have but few, if indeed any, in the United States. They have been an incalculable blessing in European countries; and although the character of the people and the condition of the arts are quite different here, it may, nevertheless, be well for the municipal authorities and benevolent persons of large means to consider whether numbers of the children now growing up in their midst in ignorance, pauperism, and crime, could not, through this double agency of training in the rudiments of education, and also in the processes of skilled labor, be both saved from ruin and made useful members of society.

Next in grade above this numerous class of what may be considered the elementary schools of industry, we have another class, still primary in their general character, and yet aiming at higher educational and

practical results than the training of poor children for individual service. Reference is made to the class of schools known in almost all countries where they are found by the title of schools of arts and trades.

THE RUSSIAN SCHOOL OF ARTS AND TRADES.

One of the earliest founded of these schools is the Russian School of Arts and Trades at Moscow, which had its beginning under the reign of the Empress Catharine, in 1775. At its origin it was designed, by means of general and technical instruction, to fit poor orphan children for the mechanical pursuits. Since that date, however, it has been expanded in aims and resources, having for its present object, as molded and sustained by the reigning Emperor, the formation of constructing mechanicians and skillful technologists.

The entire course of study occupies five years, but is so divided into, first, a theoretical and practical course, (elementary in character,) which embraces three years, and, secondly, a special superior course of two years, that many young men, already qualified to enter the second division, may there fit themselves for practical business in two years. Adhering, in part, to the original purpose of the beneficent founder, provision is still made by bursaries for the full support of 100 foundlings, and 150 poor youths and orphans; while the school is also open to boarding pupils, who pay $40 per annum, and is, furthermore, attended by an average of 150 day pupils, devoted to studies in the special course.

The instruction is given by fourteen professors in the theoretical departments, assisted by a competent force of practical mechanics and technologists in the workshops and laboratories, which are both numerous and extensive. The five principal workshops—a foundery, forges, shops for setting up machinery, the finishing shop, and the model room—are provided with lathes for wood and metals, powerful machines for cutting up the various materials, trip-hammers, and various tools and machines driven by steam; so that the pupils, working by classes and in harmony with the educational plan of the institution, are enabled, by their own manufacture, to fill orders to the average amount of $40,000 per annum, thus returning to the treasury a part of the $100,000 annually expended for the support of the institution. The school includes, besides these several workshops, a very large laboratory for technological operations and for chemical analysis; a museum of models and of mechanical and technological apparatus; collections of raw materials used in manufacture; a geological and mineralogical museum; and a valuable scientific and technical library, comprising several thousand volumes.

Some of the products sent by this school to the Exposition, and displayed under Group VI, in the Russian department, afforded excellent proof of the high and progressive character of the teaching, and contributed to that favorable opinion of Russian progress in industrial education which led the International Jury to award to the technical schools of that country, as a class, the honorable distinction of a silver medal.

SCHOOLS OF ARTS AND TRADES IN FRANCE.

Scarcely less interesting, as representative of this important class of technical schools, are the three schools of arts and trades at Chalons-sur-Marne, Angers, and Aix, which had their origin in the foresight and will of Napoleon I, when First Consul, and have since successively become centers of important influence upon the industry of Eastern, Western, and Southern France. At present they are under the general control of the minister of agriculture, commerce, and public works, upon whose recommendation large sums of money—amounting in some cases to over $200,000 for the three—are annually appropriated from the imperial treasury. Their object is to furnish to the country educated and skilled chiefs and foremen of workshops in several branches of the useful arts.

In order to be admitted, the applicant must be French, between the ages of fifteen and seventeen, and be approved by the board of examiners appointed for the department where he resides, who are required to demand satisfactory evidence of proper age, of vaccination, of good constitution, free from scrofulous taint, of having been an apprentice to a trade analogous to those taught in the school, of good moral character, together with a legal engagement, signed by his parents or guardian, to meet the expenses of personal maintenance while at the institution, and a declaration *viséd* by the mayor or commissioner of police, indicating the residence and occupation of his parents, their condition in life, the number of their children, and the particular claims which recommend them to the good-will of the government.

The examinations for admission are in reading, writing, orthography, arithmetic, (to and including fractions,) the first principles of geometry, and design. When those candidates who have passed this examination by the board report themselves at the school, they are again examined, when such as are unqualified, or of too feeble constitution, are returned to their homes.

The course of instruction occupies three years, and is both theoretical and practical—the theoretical part embracing the French language, writing, machine-drawing, arithmetic, geometry, mechanics, chemistry, and physics; the practical, actual service at the forge, in the foundery, and various workshops.

For the benefit of promising but indigent youths, the government grants a certain number of bursaries or stipends, fairly distributed, by the aid of which many of the most skillful workmen of the empire have thus been enabled to make their talents useful to the country.

The Central School at Lyons, though established and conducted without aid from the government, is no less in importance than those just named. It was established by a joint-stock company, with a capital of 250,000 francs, and is under the direction of one of its shareholders, assisted by a sub-director.

The course of study extends over three years, and is uniform for all who attend.

The subjects embraced in the curriculum are:

1. Mathematics—commencing with higher arithmetic and concluding with differential and integral calculus and analytical mechanics.

2. Physics—including general physics; industrial physics, with its applications to heating steam-boilers and accessories, and to drying and ventilation; telegraphic apparatus; electroplating; photography; meteorography, &c.

3. Mechanics—embracing an extensive range of study of prime movers, materials, and constructions.

4. Chemistry, general and industrial—especially its applications to dyeing, printing, commerce, and agriculture.

5. Civil engineering—comprising the study of materials used in building; their resistance and their use in masonry, road-building, embankments, &c.; construction of bridges, railways, locomotives and railway carriages; navigation; improvement of rivers, canals, locks, and weirs.

6. Natural history—including the organization and physiology of man and other animals; noxious and useful animals; general hygienics of man; dangerous and unhealthy occupations; contagious diseases, and how to avoid taking them; anatomy and physiology of plants; rural economy; agricultural machines; industrial plants; gathering and curing of crops; zootechny; domestic animals and their products; breeding; acclimation, &c.

7. Commercial law and accounts, in their practical departments.

8. The English language; commercial correspondence; weights, measures and coins of principal commercial countries.

9. Drawing—sketching of machines; drawing of ornaments; working drawings of machines; projection; tinted drawings; plans of machines.

10. Manufacture of textile fabrics, especially of silks—embracing natural history of silk; spinning, throwing, weaving, and testing of silks; sorting and cleaning; winding, warping, and beaming; putting up of looms; consequence of defects in operations; decomposition of tissues; and preparation of looms for weaving different fabrics.

11. Manual exercises in the workshops, such as joiners' work, turning, forging, fitting, &c.

12. Excursions to the various factories of Lyons and its suburbs.

The number of professors in this institution is 12, including the subdirecting, the aggregate of whose salaries is 30,000 francs; each professor's salary varying according to the importance of the course taught by him and the number of hours employed.

The capacity of the school for pupils is for something over 100. The number in actual attendance is very near this limit.

The charge to pupils for instruction, and use of workshops and laboratories, is 700 francs per annum. On the average, about two-thirds of the pupils pay the full amount; the remainder are aided by the Chamber of Commerce of Lyons, the council-general, the municipal council, and by the school.

On some accounts—especially in view of its entire independence of government aid, and yet its flourishing condition and great usefulness—this is one of the most interesting schools, of the class to which it belongs, that I have visited.

THE BUILDING SCHOOLS OF GERMANY.

In Germany there is a somewhat novel class of schools of this same general grade, *i. e.*, having about the same objects in view, known as building-schools, (*Baugewerbeschulen.*) There are different kinds of schools bearing this title, but those to which I refer are peculiar in that they have regular, protracted courses of study, and yet are held only during the winter; the object being to afford to practical mechanics, whose work cannot advantageously progress during the winter, an opportunity to commence and complete a systematic course of technical study, without an important sacrifice of time.

It has appeared to me that such schools might be opened with great advantage both to our mechanics and our industry in all the cities of the United States where mechanics of this class, though equal in native talent to any in the world, and capable, with proper technical training, of surpassing those of almost any other nation, are, at present, the least competent of all in those particular branches of the builder's trade that require a thorough acquaintance with the applications of science.

The period of annual study in these schools is usually about five months, beginning with the 1st of November. The full term extends through various periods, from two to four winters, and the pupils are divided into as many classes as there are terms or winters included in the course; by which means the teaching may be as systematic and—so far as success depends on a graduated system—effective as a continuous, full-year school.

Some of the building-schools—indeed, nearly all of them—are day schools; but in some cases—as, for example, where the location is a small town, and the demand for instruction is largely from mechanics residing in other places—a boarding establishment is kept in connection with them.

The school at Holzminden, in Brunswick, is an example of the boarding class. The establishment is extensive enough to accommodate 500 pupils, and there is rarely room to spare. The discipline is that of a regular college of a somewhat military stamp, the pupils wearing uniforms.

No pupils are received except such as are already engaged in some department of the builder's trade.

The cost of boarding and lodging for the twenty weeks of the term is less than $20; charges for tuition, fire and light, washing, medical attendance, and all requisite materials for writing and drawing, about $33; total expenses of the term, $53.

The course of instruction includes the following branches: German

language and correspondence; arithmetic and elementary algebra, with their applications; elements of physics and knowledge of materials; elements of mechanics, with their applications to building; details of the art of building; plotting; geometrical and ornamental drawing and modeling, (much time is devoted to this branch;) book-keeping; and excursions to examine buildings.

At the conclusion of the studies examinations are made and certificates awarded.

Nienburg, in Hanoverian Prussia, is the location of a day school of the same grade as the preceding, with 15 professors and some 200 pupils, including machinists and mill-wrights, masons, carpenters and joiners, cabinet-makers and locksmiths, as well as builders proper.

INDUSTRIAL SCHOOLS IN OTHER PORTIONS OF EUROPE.

Other portions of Germany, Belgium, Holland, England, the Scandinavian states, and, indeed, all portions of Europe, are now establishing so many schools, and classes of schools, for practical instruction in the mechanic arts, as represented by the trades, that, in reporting, one is rather at loss how to select from the multitude that crowd upon his attention.

A still higher, and the highest grade of technical schools appropriately considered under the general head of "schools of arts and trades," is notably illustrated by such institutions as the Institute of Arts, at Berlin, and the Central School of Arts and Manufactures, and the Conservatory of Arts and Trades, at Paris; examples of which are also found in Belgium, Saxony, Scandinavia, and Russia.

The Central School at Paris, at first an independent enterprise, then subsidized by the government, because of its great practical value to the empire, is now a state institution, under the general control of the minister of agriculture, of commerce, and of public works.

Its object is to qualify engineers for all branches of industry, and for such public works and service as do not necessarily belong to the engineers of the state. It is in fact almost a polytechnic school, though presenting less extensive and profound courses of professional study than some of the institutions of that class. It is open to foreigners as well as citizens of France.

Candidates for admission must be full seventeen years of age, produce the ordinary certificates of moral character, and succeed at a competitive examination bearing upon the French language, arithmetic, algebra, elementary geometry, plane trigonometry, analytical geometry, descriptive geometry, physics, chemistry, natural history, and drawing, linear, free-hand, and washing-in.

The examinations upon these subjects are both oral and written, and candidates are also obliged to execute a plan on the basis of descriptive geometry, and an architectural design of the ornamental kind, copied at a reduced scale from a given model.

The term of study is three years, and the course of instruction embraces, in addition to such mathematical and physical studies as are essential to a practical engineer, various branches of natural science, with special applications to various departments of manufacture.

It is exclusively a day-school; and the price of tuition is 800 francs per annum. Subsidies are granted by the state to pupils wanting in means, but at the same time distinguished by the manner of their passing the examinations and their rank in the school. The time for which subsidies are granted is one year, but they may be, and often are, continued to those who are especially deserving. Subsidies are also sometimes increased by amounts granted in aid of pupils by the communes and departments in which they reside. These subsidies are paid into the treasury of the school, however, and if the total amount should exceed the cost of instruction of the pupil to whom accorded, one-twelfth of the surplus is paid to him each month to aid in paying his board.

At the expiration of each year there are very rigid examinations of all the pupils of the school, but more especially of those who, having completed the full term of study, are candidates for graduation; after which all who acquit themselves satisfactorily in all the departments of study, and in all branches upon which they are examined, receive the diploma of engineer of arts and trades. Such as fall short of this high mark, but yet pass a good examination on the most important branches, receive certificates of capacity.

This important school has exerted an important influence, not only in France, but in other countries, several of which, including even Egypt, have chosen it as their model in forming plans for similar institutions.

The Conservatory of Arts and Trades is no less distinguished than the Central School just considered, though very unlike it in the character of its organization.

In this institution, the extensive museum of models of an industrial kind, collections of designs, &c., together with free courses of scientific and practical lectures, are characterizing features.

Besides all these several classes of schools established in the interest of industry, and providing regular courses of training, with scientific and practical instruction variously given, there is another important class of instructional agencies which should by no means be overlooked in this endeavor to present a bird's-eye view of what the nations of the world are doing educationally with the direct object of promoting their industries and improving the intellectual character and physical and moral condition of their working classes. I refer to the large number of mechanics' institutes, industrial museums and associations, under whose patronage popular courses of lectures on scientific subjects, together with personal instruction in drawing and in the applications of science to the arts, have become so valuable an auxiliary to the teaching of the schools.

These agencies are now in operation, in some form, in almost all

enlightened and progressive countries; but in no part of the world do they seem to have been so successful as in France, portions of Germany, Great Britain, and the United States.

The *Association Polytechnique* and the *Association Philotechnique* of Paris, the first of which has been in operation some forty years, and may be considered a pioneer in this philanthropic field, and both of which have reckoned among their active members many of the most distinguished scientists and statesmen of France, first challenge attention.

Both are purely voluntary organizations, formed by numbers of learned and practical men combined in the interests of science, of humanity, of the city of Paris, and of the empire. Each has its bureau, its halls for reading and study, its amphitheaters, and its courses of lectures and other forms of instruction for students of the French, German, and English languages, legislation, accounts, arithmetic, geometry, algebra, trigonometry, descriptive geometry, topography, design, geography, hygiene, physics, chemistry, mechanics, astronomy, and singing.

The lectures and other instruction are gratuitously given by able teachers, on certain evenings of the week, (usually four or five,) and on Sunday and various holidays, when the laboring classes, for whose benefit they are designed, find it easy and agreeable to attend. The exercises are often varied by interrogations, discussions, illustrations, experiments, &c., so as to keep up the most lively interest on the part of all concerned.

In order that persons who wish to pursue a systematic study of certain branches may be enabled to do so to advantage, a regular programme of exercises is adopted, published, and adhered to on the part of those who give the instruction with as much regularity as is usual in an ordinary day-school.

But in so great a city as Paris, one such association would prove very inadequate to supply the demand, especially among a people so active in mind, enthusiastic, and eager for knowledge as are the French; and so each of those organizations has originated a number of subordinate associations, all acting simultaneously under its lead, in as many parts of the city and its precincts. The present number of these branches under the lead of the Polytechnic Association is nineteen; the number thus far organized by the other association is twelve. By this multiplication of themselves, the population of the city and vicinity have a total of no less than three hundred and twenty-two courses of instruction in the various branches above enumerated, in simultaneous progress. Nor does this express the sum of the efforts made by these vigorous and philanthropic organizations; for both of these have extended their patronage and stimulation to the neighboring departments of France; so that the real number of sections or sub-associations having delegate membership in the central organizations is forty-nine, the pupils in attendance upon whose courses can only be reckoned by thousands.

ASSOCIATIONS OF ARTISANS, BERLIN.

The Association of Artisans of Berlin affords another example of associated effort to diffuse a knowledge of science among the working classes. It differs from those of Paris in that it asks of those who attend its courses to contribute such small amounts as they can afford toward the support of the organization, whose motto is, "Help yourselves."

The regular instruction includes evening studies in reading and writing, literature, mathematics, design, book-keeping, French, English, and gymnastics. The special courses are given on stated evenings and on Sundays, and although mainly occupied with technology, industry, commerce, and natural sciences, also include occasional lectures on political economy, jurisprudence, architecture, history, and literature. The workmen and others are invited to present any difficulties that seem to require explanation, and the professors endeavor to explain them. The lectures are given by professors from the university and the scientific and technical schools, by distinguished economists, merchants, public engineers, mechanics, manufacturers, and members of Parliament; all classes seeming to vie with each other in the zeal with which their generous service is performed.

The number of persons receiving instruction each half year is about 1,000.

The number of mechanics' institutes and industrial and scientific organizations established within the past few years in Great Britain, all having this same end in view, is very considerable. The most important of them are found at London, Birmingham, and several other of the large interior towns, Glasgow, and Dublin.

The instructional means employed are reading-rooms, libraries, and lectures. Some of these courses of lectures are very largely attended; perhaps none more so than those given under the patronage of the Royal Society of Dublin and the Museum of Irish Industry at Dublin, which sometimes have been attended by over 6,000 persons during a single year.

In some of our large cities in the United States we have mechanics' institutes that perform more or less perfectly the same general office of educating our American artisans by means of libraries, reading-rooms, and night lectures on applied science—an office well fulfilled by at least a few of them, as I can testify from personal observation. But it is very questionable whether any of them are doing the thorough work, by evening lessons and studies, as well as popular lectures, that is being done in Paris; and then many of our cities are doing no generous work of this kind at all.

II.—SCHOOLS OF APPLIED ART.

Popular education in Europe is characterized even more by the extent to which the elementary principles of drawing are taught in the com-

mon schools, of every grade, than by the teaching of the applications of science to the industrial arts.

FRANCE.

For many years France had the lead in this branch of instruction, and she still claims to be in the ascendant, though several of the other nations are about ready to, if they do not now, dispute this honor. Being eminently an artistic people, it was natural that the French should be the first in the field with the products of all those branches of industry to which art, in its different departments, is most readily applicable; nor is it strange that, once being acknowledged supreme, they should have taken much pains, by the establishment of schools of industrial or technical art, to perpetuate their ascendancy in this pleasant and profitable department of the national industry. But, after a long while, during which there seemed to be no disposition on the part of other nations to question their right to the world's markets for their beautifully-designed silks, ribbons, laces, tapestries, ornaments, ceramic manufactures, &c., they seem to have taken it for granted that the nine-tenths principle would give them permanent and undisturbed control; and so gradually began to neglect those very measures without which supremacy was impossible. For, encouraged by the final monotony of style into which French technical art had fallen, the Germans, Swiss, Russians, and, by no means least of all, the English, have found that they, too, have a capacity for that same sort of work; and, since that conviction first stole over them, in 1851, have been most industriously employed in making themselves ready to rival the fine products of French genius. How well they are succeeding, the Exposition of 1867 was a convincing witness.

All over Europe this artistic spirit has been diffused to such an extent that almost every city has its day and night schools of design, and every industrial school its trained teachers of the elements and the applications of art.

GREAT BRITAIN.

In Great Britain this development has been even more surprising than on the Continent, especially during the past ten years. The work has been under the direction of the Science and Art Department of the Committee of Council on Education, whose enterprise has been so great that, from having, but a few years since, almost no schools of art at all, the United Kingdom now has no less than 92 such schools in almost as many towns, with 17,341 pupils under instruction, and 73 night-classes for instruction in drawing in 60 of the principal towns, with a total of 2,547 pupils. I should not omit to state that the above-recited figures are simply intended to show the number of pupils in attendance on all the schools on a given day, not the number of persons who receive instruction in art during the year, of whom the number is usually between 90,000 and 100,000.

As at once illustrating the plan of this English science and art department for the advancement of industrial art, and showing the present position of France as appreciated by one of her own citizens, I am induced to give the following quotation from a report just made by a French commission appointed under a recent decree of the Emperor:

"The institutions dependent on the science and art department are divided into two categories:

"1. Public teaching: Embracing schools of art and local associations of primary schools for teaching drawing; annual inspections of the local schools and primary schools combined in associations; annual local competitions; central museum at Kensington; loans of models and books on art from the museum to local schools; exhibition in the localities of the articles thus lent; pecuniary grants to the local schools for purchase of models, and, in certain cases, toward the expense of first establishment.

"2. Training of art masters: Examinations of fitness, and graduated certificates; free admission of exhibitioners from the schools of art, and of pupil teachers intended to become art masters; normal school of art; certificates to teach elementary drawing, given upon examination to primary school-teachers of either sex.

"Notwithstanding this organization, which would seem to indicate that the art department has become a sort of university for teaching drawing—acting like the French University for literature and science—the action of the department is limited to encouraging local or private foundations, to directing their efforts, to preparing and training capable teachers, and to indicating by general programmes the proper course to be pursued.

"The summary programme of the central schools of drawing is as follows:

"1. Elementary course: Geometrical drawing; linear perspective; free-hand drawing, with shading; drawing from relief; figure drawing from lithographed or engraved models; principles of water-color drawing.

"2. Superior course: Drawing from relief; painting; ornaments; flowers; still life; landscape.

"3. Special or technical course: Art anatomy; elementary composition; designing; modeling; architectural and machine drawing."

SOUTH KENSINGTON MUSEUM.

"Everybody knows the magnificent art museum at South Kensington, for the founding of which the science and art department has collected from all quarters master-pieces of every kind, at a total expense to the state of not less than a million sterling since 1852. Besides this outlay for first establishment, the department has a yearly grant of £80,000 sterling.

"By the extent of the resources placed at the disposal of this special and new department, created for the purpose of enabling English industry to compete with ours, an opinion may be formed of the importance

rightly attributed in England to the participation of the art of design in all industrial productions, and no surprise can be felt that such efforts have called attention, in France, to the necessity of maintaining, among ourselves, that superiority against which the foreigner sought to struggle by giving a greater development to the teaching of drawing.

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"England is not the only rival of French industry which has recognized its superiority with regard to works which require the aid of art and taste. Germany, moved by the same sentiment, has organized since 1852, at less cost, but perhaps with as much success, drawing schools of different grades. In all the practical schools, and in the polytechnic institutions, the teaching of drawing holds a prominent place; and almost everywhere the method which had been systematically organized by the late M. Dupuis is successfully followed—a method which consists in habituating the pupil, as soon as he can well hold a pencil, to draw from models in relief, or from natural objects.

"The drawing, which is justly regarded as the best in Central Germany, is that of Nuremberg, the director of which has laid down the principle that, to become a skillful industrial interest, it is indispensable first to study art in all its varieties. Under his energetic supervision a great number of professors and artists have been trained, who have disseminated good methods, and have brought about in the productions of industry, especially in those of Nuremberg, a most remarkable artistic improvement."

WURTEMBERG.

"In the kingdom of Wurtemberg, the department of commerce and industry has organized, in nearly every town, classes for drawing, modeling, and sculpture in wood and stone. These are often conducted by workmen who have become sufficiently skilled, and who, without abandoning their profession, undertake the duties of teachers in the evening. Annual exhibitions of the drawings executed by pupils are held at Stuttgart, when rewards and prizes are awarded to the pupils and masters who present the best works.

"Beside the study of artistic drawing, properly so called, that of linear drawing, based on geometrical principles, has also been widely extended in Germany. Descriptive geometry is taught elementarily, and with entirely practical applications, in the drawing classes opened for artisans, where they also acquire the theory of projections.

"Collections of technical drawings relating to the working details of the more important manufactures, and generally executed in a very good style, were communicated to the members of the commission who visited Germany, and may be consulted with profit by those who undertake to organize classes of the same kind for young workmen.

"All these efforts, made by countries which are our rivals in industry, must not be overlooked by us; and however great our confidence in the

superiority of the national taste, it is desirable to keep a watchful eye on the progress made abroad. The impression which this progress has made on a few enlightened friends of our industrial arts is very strong; and fears, perhaps a little exaggerated, have been expressed that France may be in danger of losing the lead in matters of taste. On this subject one of the members of the commission, most competent to form an opinion on the gradual, continuous, and ever-ascending progress of industrial art in France, has given convincing information. He asserts that this superiority is constantly maintained to the same extent, and that if our public exhibitions occasionally display productions of doubtful taste, such a circumstance does not show, on the part of our manufacturers, any contempt for the rules of art, but is simply the result of concessions made to the necessities of trade. Nevertheless, though this information justifies us in retaining, in spite of the progress made by foreign rivals, full confidence in the superior taste of our artists and of the public, in the midst of whom they live and often find their inspirations, it is still necessary to take into account the considerable development which, since the late universal exhibitions, the teaching of drawing has received abroad, especially in England and Germany."

APPLICATIONS OF THE FINE ARTS IN THE UNITED STATES.

In view of our own recent origin as an independent nation, and the necessity there has hitherto been in America for the exercise of the ruder and, so to speak, heavier mechanical arts, to the exclusion of the finer arts, it is not to be wondered at that almost nothing has yet been done by us in the direction of a cultivation of art in its character of pureness, or in its industrial relations. The time has at length arrived, however, when we should begin a systematic endeavor to establish our claim to a position with the older nations of Europe in many of the higher and more artistic departments of manufacture. What we have already essayed in this direction has afforded the most satisfactory evidence of a native taste and genius, which, if carefully cultivated, will leave us nothing to envy any nation, not even France, in this regard.

In this work of art development, if undertaken without too much delay, we shall be only a little behind most other countries in time, and with the superior general intelligence of our working classes, and that peculiar aptness and ingenuity for which our people are justly noted, we would have an advantage which time alone could not offset. The economical argument, therefore, strongly re-enforces the æsthetic one presented in the chapter on schools of art; and both together demand, with a voice that should be heard and heeded, the prompt adoption of measures for providing instruction in the elementary principles of drawing and modeling in all our public schools, and in the industrial applications of art in all our schools of applied science.

CHAPTER VII.

APPLIED SCIENCE SCHOOLS.

I. Schools of chemistry—The great number and extent of the schools in Europe—Courses of instruction—Schools and instruction in the United States—II. Schools of agriculture—Austrian school at Krumau and at Prague—Russian schools—Saxony—Wurtemberg, Royal School at Hohenheim—The School of Practical Farming—Agricultural schools connected with other institutions—Bavaria—Ireland—Russia—Great Britain—Belgium, Germany and other parts of Europe—Agricultural education in America—III. Schools of forestry—IV. Veterinary schools—V. Schools of Mines—Austrian school at Chemnitz—Saxony, Mining Academy of, at Freiburg—Prussia, Clausthal—Sweden—Russia—Imperial School of Mines of France—Great Britain—United States—VI. Schools of engineering—VII. Schools of architecture—VIII. Schools of navigation.

I.—SCHOOLS OF CHEMISTRY.

The number of schools of chemistry in all the European countries is already very considerable; and yet the growing demand for careful analysts and technological chemists, made by every department of industry, necessitates a steady increase. In nearly all the polytechnic institutions chemistry constitutes a school, as also in many of the universities; besides which there are many like schools, though less complete and comprehensive, existing in connection with private laboratories.

The number of schools of chemistry must, of necessity, be greater in proportion to the number of students than of other professional schools, for the reason that so much of the teaching must be personal, and that so much of the study consists of practical operations in the laboratory. Unless the laboratory be very extensive—a condition involving great expense—no distribution of time among pupils will render it possible for a very large number to receive instruction in one school.

Usually the number of separate places for practical study in a laboratory does not exceed thirty or forty, and it is often less. The largest number of which I have knowledge—and I have seen those connected with all the leading universities and technical and polytechnic schools of Europe—is found in the laboratory of the Federal Polytechnic School at Zurich, in which there are accommodations in all the departments—inorganic, organic, and technical—for about one hundred students. The accommodations are also very extensive, and of superior character, at Carlsruhe, Paris, London, Munich, Vienna, Berlin, Heidelberg, Jena, Bonn, and St. Petersburg. Formerly Giessen was a great center for the ingathering of students of chemistry; but that was in the days when Liebig, who then resided at Giessen, drew to his brilliant discoveries the attention of all Europe. Subsequently, however, this interest was transferred to Munich, where that distinguished savan now resides.

The term of study in most of the schools of chemistry is two years; though in some—as in the chemical department of the Royal Polytechnic Institute of Vienna—it is three years.

The subjects taught, with the time devoted to each, though varying somewhat in different schools—in the most important period of study is two years—are substantially the following:

First half-year: Important selections from inorganic chemistry, two hours a week; experimental physics, with technical bearings, six hours; chemical technology, particularly in directions demanded by the locality or country in which the school happens to be placed, three to five hours; study of machinery employed in chemical manufacturing, with examinations, three hours; analytical chemistry, two hours; mineralogy, four hours; principles of general botany, three hours; zoology, with repetitions, six hours; analytical practice, nine hours; technical drawing, four hours; experimental chemistry, six hours.

Second half-year: Organic chemistry, six hours; analytical chemistry, two hours; metallurgy, two hours; chemical technology of building materials, one hour; practice in technical laboratory, twelve hours; technical drawing, four hours; special botany, (obligatory upon students preparing for pharmaceutical practice,) six hours; general zoology and anthropology, (obligatory upon students with technical aims,) three hours; study of important economic plants, (obligatory upon students with technical aims,) two to three hours.

Third half-year: Chemical technology, (obligatory upon technical students,) four hours; mechanical technology, (obligatory upon technical students,) three hours; applied crystallography, (obligatory upon technical students,) three hours; technical geology, two hours; technical practice, (obligatory upon technical students,) twelve hours; technical drawing, (obligatory only upon technical students,) four hours; pharmaceutical chemistry, (obligatory only upon students aiming at pharmacy,) three hours; pharmaceutical botany, (obligatory only upon pharmaceutical students,) three hours; analytical practice, nine hours.

Fourth half-year: Lighting and warming, two hours; exercises in the technical laboratory, twelve hours; chemical technology of the ordinary trades, two hours; analytical practice, twelve hours; determination of minerals, three hours; pharmacology, (obligatory only upon pharmaceutical students,) two hours.

The usual number of professors giving instruction in the most complete European schools of chemistry is from six to twelve.

It is a department of science from the first remarkable for the large number of distinguished men who have devoted themselves to its development, it is also true to-day that a full list of the professional chemists of the world would present a larger proportionate number of great names than almost any other profession.

As yet we have no complete distinctive school of chemistry in the United States, but extended and thorough courses of instruction, in both general and analytical chemistry, are given in several of our schools of

science connected with the older universities, as, for example, at the Sheffield School of Yale, the Lawrence School at Harvard, and the School of Mines at Columbia College, New York. At all of these institutions the laboratory accommodations are extensive and superior, the instruction is ably given, and is adapted to the practical wants of the country. Yet, until within a few years, most of our young men who have chosen chemistry as their profession, and have desired to thoroughly qualify themselves for its practical duties, have felt obliged to study in the Old World. In my visits to the great laboratories of Germany and Switzerland I have failed in but few instances to find one or more—sometimes a dozen—American students at work in them. Indeed, it is chemistry, more than any other department of study, that attracts our young men to the European schools.

This supposed necessity for crossing the ocean to gain a mastery of the best methods of analytical and technical chemistry ought not to exist. The instruction in these branches in our best American schools of science is given by gentlemen who, by their studies and original contributions to science, have justly acquired a high reputation among the leading chemists of Europe; and it may be questioned whether all who go to Europe for study in the famous laboratories come back really better qualified than might have been the case if they had limited their ambition to certain American schools, maintained in connection with our leading universities.

But after all, it is undeniable that we are still relatively deficient in this department of education to a degree that ought to awaken more interest, and warmly enlist the practical sympathies of State governments and men of wealth, jealous for the national honor.

II.—SCHOOLS OF AGRICULTURE.

Agriculture, though first among the occupations of men in the order of time, and the most complex and difficult in actual practice, for the reason that it touches the domain of every science, and cannot, by any possibility, except upon virgin soils and under a combination of the most favorable circumstances, attain to the highest success until it shall have mastered the principles of each and brought them into its service—agriculture, first among the arts in importance, and surely destined in the further progress of the race to be first, also, in rank and honor, has been the very last to acknowledge its dependence on the sciences, and so avail itself of their teachings. But conviction is coming at last; and to-day no educational question occupies more of the attention of the educators and statesmen of civilized nations than how to organize and operate institutions and other agencies for the development of agricultural science and the diffusion of its light among the groping millions who cultivate the soil.

For many years after the development of true chemical and physiological science, and the dim recognition of its applicability to agriculture,

the only instruction in any sense professional, or that had direct bearing upon the agricultural art, was given from single chairs tardily established in here and there a liberal institution in the Old World.

One of the first of these tentative efforts to elevate and advance agriculture had its origin at Alfort, near Paris, where, in 1785, the illustrious Daubenton established, in the veterinary school, which still flourishes there, a "course of agriculture and rural economy." Subsequently, in 1793, the celebrated Thouin founded at the *Jardin des Plantes* of Paris a "course of vegetable physiology applied to culture." Both of these endeavors were successful and the chairs then established have continued to the present time, having been occupied by scientific men of high distinction. Nevertheless, the first Napoleon, when he undertook the reorganization of the public instruction of the empire, and provided for the establishment of several special schools, so far underrated the practicability of making special schools of agriculture successful that they were not included in his plan. And thus the initiation of that great enterprise which has since commanded the confidence of every enlightened nation of the world was left to other powers.

To Prussia, Switzerland, and Austria belong the honor, in common, of founding the first schools specially designed to give instruction in the applications of science to agriculture; the school founded by the illustrious Thaer, at Celle, in Prussia, the one established by Emanuel von Fellenburg upon his estate at Hofuyl, near Berne, and the agricultural academy founded upon one of his immense estates at Krumau, in Bohemia, by Prince Schwartzenburg, all three dating from the same year, to wit, 1799.

The Swiss school, so successful for nearly half a century, not only as independently considered, but likewise as a model for hundreds of other institutions with similar aims, soon after the death of its founder, in 1844, began to languish and at last virtually discontinued its labors; and Thaer's school was removed to Mogelin in 1806.

AUSTRIAN SCHOOLS.

The Austrian school at Krumau, on the other hand, still holds its place among the leading schools of the present time. Being established on an immense estate, (originally embracing 300,000 acres,) its natural facilities for imparting a knowledge of practical forestry and the management of large estates have been superior; while great pains have been taken to furnish other auxiliaries in the form of extensive collections of agricultural implements and machines, as well as of the cultivated plants of the country, and of fruits, noxious insects, &c. The instruction is gratuitous and is usually well attended.

At Prague, in 1803, was founded another institution. Nor did the government of Austria rest content with the erection of these two schools, but in 1809 founded those of Gratz, Lemberg, Trieste, and Trutsch, and has from that time to this continued to multiply them in

various forms, adapted to the special needs of different sections of the empire, until now they are found in nearly or quite all the provinces.

Among the separate and distinct schools of agriculture in Austria, the Imperial and Royal Agricultural School of Hungary at Altenburg is of high rank, and was, moreover, the representative of its class at the Exposition. It is a superior or academic school, and to the general course in agriculture adds a course in forestry. The attendance of pupils in 1867 was 147; the instruction being given by nine professors, with the aid of superior facilities in the way of a chemical laboratory, a large and valuable library of scientific and practical works, numerous mechanical and technological collections, and a botanical garden.

Among other objects of interest sent to the Exposition by this school, a complete collection of specimens and models, illustrative of the production of Indian corn, (the leading staple of that portion of Hungary,) its chemical constituents and the various transformations it undergoes from the moment of planting until the product, in its many forms, is ready for consumption, together with interesting botanical collections, samples of soils, with the results of their chemical analysis, and with numerous designs, charts, &c., all prepared by the pupils, afforded good evidence of the zeal and proficiency of the pupils there taught.

The term of study includes four half-year semesters, during which, in systematic order of succession, the following branches of study are taught as thoroughly as the time will allow: Practical geometry; general mechanics; agricultural implements and machinery; general and agricultural chemistry; climatology; mineralogy; knowledge of soils, *(Bodenkunde;)* the anatomy and physiology of plants; orchard, kitchen, garden, grape, and hop culture; forestry; zoology; anatomy and physiology of domestic animals; general and special breeding of domestic animals; diseases of domestic animals; farm management; science of valuations and book-keeping; technology; architecture; local agricultural relations and circumstances; national economy.

The applicant for admission must be at least seventeen years of age, possess good moral character, and have completed the course of study embraced in the first seven classes of a gymnasium or the first five classes of a real-school, or have completed the entire course in an agricultural middle-school, (school of second grade.)

The Superior Agricultural School at Gratz, though one of the most interesting and successful that I have found in Austria—having courses of instruction, by nine professors, in mathematics; mechanics; physics; botany; zoology; mineralogy; geology; chemistry; agriculture, and forestry, with fine collections in natural history, &c.; a silk-worm house, and a beautiful botanical garden; likewise embraces a school of mines—belongs rather to the class of polytechnic schools, of which notice will be made in a subsequent section. It is also true of a large proportion of the schools more recently established, including those of secondary grade, that they exist in connection with either general instruction or with other special courses or schools.

Special Austrian schools of forestry are found at Mariabrunn, near Vienna, and at Schemnitz; neither of which, however, is very noted.

PRUSSIAN SCHOOLS.

In number the Prussian schools of agriculture have outstripped those of Austria; the total of different grades being over fifty, while the latter power numbers not to exceed forty. Only eight or nine are of superior grade, however, and most of these are more or less intimately connected with universities; as, for example, the ancient school of Mögelin, near Potsdam, whose director is at the same time the leading professor of agriculture in the University at Berlin, the Academy of Agriculture and Forestry at Eldena connected with the University at Greifswald, the Agricultural Institute of the University of Halle, and the Agricultural Institute at Weiden, connected with the old University of Göttingen, (also Prussian since 1866.)

Those of Mögelin, Eldena, and Weiden are located upon large farms; while the institute at Halle occupies but twenty-five acres, merely enough for experimental uses.

Besides these different kinds of schools, Prussia abounds in what are called experimental stations, the object of which is to settle various scientific and practical questions connected with agriculture.

SAXONY.

Saxony comes next in chronological order, with its Academy of Forestry and Agriculture at Tharanadt, near Dresden, founded in 1811. This institution was at first almost exclusively a school of forestry, but now incorporates agricultural instruction as well. The term of study is either two or three years, at the option of pupils. The instruction is given by nine able professors, and embraces the usual branches taught in such institutions, with an unusual frequency of excursions into the forest and the best agricultural districts of the kingdom.

Besides the school at Tharanadt, there are four other agricultural schools and departments of schools in Saxony.

In both France and Wurtemberg there were established agricultural schools of the isolated and independent type, in the year 1818—the French institution by Dombasle, on his estate at Roville, and the Wurtemberg school at Hohenheim, near Stuttgart.

The first named, after many years of heroic effort, was finally discontinued in 1848 as a private institution, and converted into one of the regional schools of the empire, of which, besides the seventy or more elementary agricultural schools, there are three—the other two being at Grignon, near Versailles, and at Saulsaie, in the department of Ain.

Many of these schools I have visited, and, did space allow, would be glad to describe; but as I deem them, all in all, inferior to those of some of the other states, I shall omit such descriptions in accordance with the general plan of my report, which is to select for detailed account such schools as will best illustrate the most advanced conditions.

WURTEMBERG.

The Royal Land and Forest Academy of Wurtemberg has long held the first rank among the agricultural schools of Europe. It is located at Hohenheim, some seven miles from Stuttgart, upon an estate formerly belonging to Duke Charles, Regent of Wurtemberg. The buildings occupy a high swell of ground, commanding one of the most extensive and beautiful views in Germany. They include three open courts, rectangular in form, presenting a continuous front of one thousand feet; and, though the marks of nearly one hundred years, during which they have stood, are noticeable upon them, they nevertheless still make an imposing appearance and answer the more modern use to which they have been put exceedingly well.

The farm embraces between eight hundred and nine hundred acres, and lies in immediate contiguity to a government forest of five thousand acres, which thus affords extraordinary facilities for acquiring a practical knowledge of forestry as well as of agriculture. It is well planned, and conducted on the basis of a scientific rotation of crops, serving the double purpose of a model and an experimental farm. But the important work of experimenting is still more thoroughly carried on upon a subdivision of the farm known as the experimental grounds. These embrace some twenty acres, divided into about one hundred plats, upon which systematic experiments are conducted with the different crops grown in that portion of the continent as well as with new species and varieties supposed to be adapted to its soils and climate. It is upon these plats that are tested questions based upon soils and their preparation, manures and their application, methods of cultivation, harvestin &c.; questions of vital importance not only to the agriculture of Germany, but of the temperate latitudes everywhere.

Connected with these experimental grounds there is likewise an establishment which, together with them, is known as the experimental station. It is provided with chemical and other scientific apparatus necessary to all sorts of agricultural investigations, and is presided over by the chemical professor, with a responsible subordinate, who resides therein and gives constant personal attention to solutions of the problems attempted.

There is also a well-planned botanical garden embracing several acres, in which are grown all sorts of plants possible to the climate and soils of the location; a beet-sugar factory, a brewery, a distillery, a starch factory, a vinegar factory, a malting and fruit-drying establishment, a silk-worm establishment, and an agricultural implement and machine manufactory. The last-named is sufficiently extensive to employ some forty workmen; the design being not simply to afford the means of instruction to pupils in the principles and art of constructing implements for the uses of husbandry, but also to supply the different markets of Germany with the best models.

Considered as an institution of learning, the Royal Academy at Hohenheim consists of three quite distinct schools, to wit:

1. The institute, having the character and rank of a professional school of agriculture.
2. The school of forestry.
3. The school of practical farming.

The institute and school of forestry were designed for advanced young men, able to understand purely scientific lectures. As a general rule, the pupils are either the sons of the gentry, fitting themselves for the general management of inherited estates, or ambitious young men from the middle classes, looking to a stewardship over the estates of others. The requisites are the attainment of eighteen years of age, good moral character, proficiency in the preparatory branches, (equivalent to a common-school education in the United States,) and the payment for lodging, instruction, and incidentals, of $40 to $80 (foreigners pay twice as much as inlanders) per annum. There are accommodations for over one hundred pupils in the lodging apartments, and for an indefinite number at the restaurant connected with the institution. But if pupils prefer to take their meals and lodgings elsewhere they are at liberty to do so. So, also, each pupil may exercise his own discretion as to the number and kind of lectures he will attend, though industry, regularity of attendance, and a faithful use of the opportunities offered are urged upon all. In these respects they are subject to as little restraint as the students of our own professional schools.

The School of Practical Farming *(Ackerbauschule)* is designed for the sons of peasants, between the ages of fourteen and eighteen, who have familiarity with the ordinary routine of farm-work, and desire simply to acquire a knowledge of the general principles of agriculture and the most practical methods. They spend but two or three hours daily in gaining theoretical and scientific knowledge, and the remainder in actual labor on the farm, and in the other practical branches of the academy, under the direction of the practical foreman or immediate managers.

Besides these three distinct branches or departments, there are several special courses or schools, designed to give instruction in the principles and especially the practice of different branches of industry. These courses, as a rule, are only open to such as have already acquired, by some years of practice, familiarity with the particular branch of industry to be taught and illustrated in the course to be pursued. They are, therefore, necessarily young men of seventeen or eighteen years of age, with sufficient maturity and discipline to enable them to derive benefit from the brief courses of a few weeks furnished them at the Royal Academy. Then there are courses in gardening, in orcharding, in meadow husbandry, in sheep husbandry, &c. And more recently there has been established a course of three weeks in autumn, (during the summer vacation in the common schools and the farm schools of the kingdom,) for the better instruction of school-teachers in the general principles and practice

of agriculture. The number of those who may be admitted to this course is limited to twenty-five, and only those are entitled to enter who have shown by their personal labors, either on their own or on the school-house grounds, a disposition to promote the advancement of agricultural education.

Again, in addition to these regular courses of instruction, such occasional or extraordinary courses are opened and conducted from time to time as the exigencies of industry or of the civil service of the state seem to require. In all these ways the academy occupies a very wide field, and by its great usefulness to the state has acquired a marked influence, not only in the kingdom of Wurtemberg, but in all the countries of Europe.

The immediate management of the whole institution, in all its branches, as well as of the farm, garden, experimental grounds, and all else connected with it, is intrusted by the government to a director, assisted by a secretary, a treasurer and book-keeper, an overseer for the institute, a farm assistant, a house-master, a postmaster, and a telegraph operator; which last also serves the public at large, the post and telegraph offices for Hohenheim station being in, and in a certain sense a part of, the institution.

The instruction is given by the director and twelve other professors, in charge of the following general departments, to wit: Mathematics, natural science, theory and practice of agriculture, practical forestry, forest economy, state forestry, agricultural technology, political economy, rural architecture, and the draughting of plans.

The instruction in the academy is given by lectures, by demonstrations, by excursions, and in connection with actual practice in the field and forest.

The following are the courses of study in agriculture and in forestry, together with the collateral branches taught:

Agricultural course: General agriculture and plant culture; special plant culture; meadow culture; grape, hop, and tobacco culture; fruit culture; culture of vegetables; breeding of domestic animals in general; horse-breeding; cattle-breeding; sheep-breeding; breeding small animals; silk-worm culture; bee culture; forestry; forest valuation; Wurtemberg forest laws; practical forest business.

This course is supported by scientific instruction in arithmetic and algebra; planeometry; stereometry; trigonometry; practical geometry; mechanics; taxation; book-keeping; physics; general chemistry; analytical chemistry; agricultural chemistry; geognosy; special botany; vegetable physiology; general zoology; special zoology; veterinary science; economical architecture; principles of law; national economy.

Courses in forestry: Encyclopedia of forest science; agricultural encyclopedia for foresters; forest botany; growing woodlands; protection of forests; technology of forests; valuation of forests; Wurtemberg forest laws; forest taxation; practical forest business.

The collateral branches are the same as above enumerated in connection with the agricultural course.

The period of a full course in both the institute and the forestry school is two years; though, if specially prepared for admission by a judicious course of preliminary study, one year may suffice. Each scholastic year embraces two sessions; the first beginning November 1, and continuing to Palm Sunday, the second beginning two weeks after the close of the first and ending October 1. Examinations are held semi-annually, but these are obligatory only upon such forestry pupils as intend to enter the government service. Such as are examined receive a certificate of proficiency or of completion of the studies included in the course of instruction, together with a statement as to diligence and general deportment. Students not examined receive simply a certificate of attendance, specifying the length of time they have spent in the institution. The expenses of the academy for salaries, instruction of every kind, library, buildings, management in general, &c., are about 34,000 florins (of 40 cents each) per annum; the income from tuition fees, some 20,000 florins; the profits of the farm, about 6,000 florins; leaving a deficit of 8,000 to be paid by the government. The school of practical farming and the school of horticulture, being considered institutes solely for public instruction, are entirely supported by the government.

SCHOOLS CONNECTED WITH OTHER INSTITUTIONS.

Of the second class of agricultural schools, those connected with other institutions, especially universities, the number is less, though constantly increasing. The three most highly-approved by Baron Liebig, on whose special recommendation I visited them, are those connected with the ancient universities of Halle, Jena, and Göttingen.

In this connection it is proper to make more particular mention of the agricultural agency known as the experimental station, (*Versuch station*,) which consists of a few acres of land—twelve to twenty—divided into small plats for purely experimental purposes, in the midst of, or in immediate connection with which there is a chemical and physical laboratory, and not unfrequently such accommodations for domestic animals and such general facilities for physiological investigation as are suggested by the problems of breeding, ordinary feeding, fattening, &c.

Stations of this sort have sprung up since the discovery of the applicability of chemistry to agriculture as a means of settling the formerly troublesome questions of natural fertility, manuring, and rotation of crops, and so on; and if I am not much mistaken, as now established and conducted, were suggested by Baron Liebig. At all events, he attaches great importance to them and has been largely instrumental in their establishment in nearly if not all the German States. It is easy to see that, in the present undeveloped condition of the science of agriculture, such agencies are a primary necessity; and, judging from the practical workings and invariable success of those I have visited in the different continental states, they are destined not only to go hand in hand with

the agricultural schools, but to be established in many cases independently, and where it is neither practicable nor needful to establish a school. In most cases in Europe experimental stations are established and maintained at the expense of the government, as a necessary means of determining the principles which underlie the most successful practice, and as being therefore essential to the industrial development of the state. It is unnecessary to remark that their multiplication in the Old World, while it must tend very greatly to advance the science and art of agriculture throughout the world, by the discovery of principles of universal application, they cannot settle all the questions that must arise, since many of them are limited in scope by circumstances of locality, and can only be determined on the very spot where they arise. They must be established in every country, therefore, and in many parts of each country, as the pioneers of the profession of agriculture that is to be.

BAVARIA.

The first Bavarian school of agriculture was founded at Schleissheim, on an estate of nearly seven thousand acres, in 1822, but has recently been removed to the old estate of Weyhenstephen, near Freising, some twenty miles north of Munich. It occupies a farm of several hundred acres, well stocked with domestic animals, and appears to be in a healthy condition. The course of instruction embraces two years, and is given by six regular professors with as many assistants; number of pupils usually about fifty.

Besides this Royal Central School at Freising, Bavaria reckons eleven other agricultural schools of lesser rank, all of them liberally supported or aided by the state.

IRELAND.

The beginning of agricultural schools in Ireland was at Templemoyle, near Londonderry, at which place the Northwest-of-Ireland Society established a farmers' school in 1827. There are nearly two hundred acres of land connected with the institution, which still continues to flourish. Since that date, besides the model farm and school at Glasnevin, near Dublin, founded in 1838, and designed for a sort of normal agricultural school, the number of schools of lower grade have multiplied until the number now exceeds seventy.

RUSSIA.

Russia early manifested an interest in the general movement for the establishment of schools of agriculture and forestry, and as early as 1824 founded an intermediate school for such instruction, including also engineering as a subordinate branch, at Marjino. This was followed, four years after, by the establishment of a school for instruction in bee culture—the pioneer of a great number of agricultural and industrial schools, devoted each to some individual branch. But the first Russian

school of superior grade was established at Gorky in the government of Moheelev, in 1833. Its object was to form a nursery of professors for the secondary schools of agriculture, of which there were five already in operation, and others in contemplation, sufficient in number to supply all the subordinate governments of that great empire. It was required of applicants for admission that they should have finished their studies in the *gymnases* (colleges) or in agronomic schools of second rank. Since 1863 this school has been transferred to Lesnoy, in the vicinity of St. Petersburg, where, in the year 1867, it was my pleasure to find it in a most flourishing condition. The course of study occupies three years, and embraces, in general terms, chemistry, physics, mineralogy, botany, zoology, mathematics, geology, mechanics, architecture, technology, zootechny, agricultural theory and practice, forestry, rural economy, political economy, and statistics.

The number of professors is 15; of pupils, 90. By reason of an annual appropriation from the imperial treasury of $50,000, tuition is free. Pupils, nevertheless, pay about $24 per annum for the privilege of the chemical, physical, technological, and botanical laboratories.

The experimental grounds include about seventy-five acres, upon which, during the summer semester much time is devoted to the practical field-studies. From June to September the professors also frequently lead their pupils in botanical, mineralogical, and agricultural excursions.

In 1836 was founded the Imperial Agricultural Institute at Gorigoritz, embracing primary, intermediate, and superior departments. Then rapidly followed the creation of numerous establishments for the production of silk, with departments for instruction in the art; schools of horticulture; farm schools; model farms; special schools for the culture of flax, &c.; all distributed with a liberality almost profuse over the vast territory of the empire according to the nature of the soil and climate and the habits and needs of the people. Then in quick succession were established the great agricultural museum at St. Petersburg, with numerous lesser ones of various grades in diverse portions of the empire; a large number of secondary schools of agriculture located at Moscow, Kasan, at Gorky, at Saratov, at Kharkov, and other points; also many schools of horticulture, chief among which are those at Orel, at Ouman, at Kieff, and at Voronezh; schools of vine culture at Magalatch, in Central Russia, and at Kischineff, in Bessarabia; schools of agriculture and horticulture in Caucasia; and last of all, and chief among all, the great Academy of Agriculture and Forestry, founded by the minister of domains, at Petrovskoi, near Moscow, in 1865.

The secondary schools of agriculture above referred to are among the most flourishing of their kind in Europe. Each school is provided with chemical laboratories, physical and agricultural cabinets, and with a model farm well stocked with implements and domestic animals. The course of instruction occupies five years, and includes religion and Christian morals, arithmetic, natural sciences, the Russian language,

geography, history, and design, together with practical exercises in the laboratories and on the farm. They are attended by an average of one hundred to one hundred and fifty pupils, and each school is endowed with a regular income from the state of $8,000 to $12,000, according to the necessities of the locality.

The schools of Caucasia, established since the conquest by the Russian government and the Agricultural Society of Caucasia jointly, are remarkable for their liberality, which in some cases goes quite beyond gratuitous instruction, and even secures to the pupils small incomes sufficient to meet all expenses of their education.

Thus, at the farm school of Latschino, near Tiflis, upon the property of Baron Nicolaï, the instruction given in geometry, surveying, and the applications of science to horticulture, arboriculture, bee-culture, vine-culture, silk-culture, the breeding and rearing of domestic animals, and to general agriculture is not alone free; but boarding, lodging, clothing, books, &c., are also gratuitous, and the pupils, (of whom the number is limited to twenty-two,) moreover, each receive $40 for the first year, $64 for the second, $72 the third, and $80 for the fourth and last year, for other important uses. The Horticultural School of Tiflis, the School of Viticulture at Katchéti, the School of Silk-culture at Stavropol, the Horticultural School at Rohtaïs, and the Agricultural School at Wadikarkas are also entirely free.

The Russian agricultural schools of academic grade are entitled to high rank among the best in Europe. The Agricultural and Forestry Academy of Petrovskoi, near Moscow, to which incidental reference has already been made, as being at once the highest and the most recently established, (in 1865,) is worthy of more special notice. This institution embraces two faculties, one of agriculture and the other of forestry, the duration of the course of study in each being fixed at three years. Any one, whatever his condition in life, on making advance payment of $10 per *semester* is admitted to the instruction furnished. Extensive buildings have been constructed for the accommodation of pupils who desire to live on the premises; the price of a furnished chamber being $3 a month. A large restaurant, in which the dietary regulations are determined by the administration of the school, provides food for all, at fixed and moderate prices.

The courses of study, conducted by eighteen able professors, embrace instruction in the following general departments, to wit: agriculture, zootechny, veterinary science and art, rural constructions, civil engineering, sylviculture, agricultural and forest technology, and rural and political economy.

Auxiliaries, including a valuable special library, an agricultural museum, a cabinet of physical technology, collections of models of apparatus and agricultural and forestal machines, zoological, botanical, and mineralogical cabinets, dendrological collections of much interest, an immense chemical laboratory, and a large farm, are provided with a liberality worthy of the great empire.

The farm comprises about twelve hundred acres, of which between eight and nine hundred is arable land and the remainder forest, and is already provided with a nursery, fruit, kitchen, and botanical gardens, with a dairy, wagon-houses, and well-equipped establishments for implements of every kind, and with well-arranged barns for grain and domestic animals.

The academy confers two degrees, that of bachelor and that of master. In order to secure the first the student must pass an examination in all the sciences taught, whether they relate to agriculture or to forestry, and present to the council a scientific memoir upon a given subject. To obtain the degree of master, the applicant must present his diploma of bachelor, undergo a second examination, and publicly defend a thesis on some relevant subject.

The number of students attending this great institution in 1866 was four hundred and fifty, of whom eighty-five received, in addition to free tuition, bursaries of some $20 each. But all this magnificent array of forces and material, with a patronage approached by no other institution of like character in the world, does not adequately illustrate the spirit and energy with which the government is pushing forward the noble work of educating the agricultural classes. The present status merely is thus indicated. The purpose and the energy of the government are further and even more forcibly shown by the fact that its annual appropriation to this one great academy at present exceeds the sum of $100,000.

In view of these movements of the Russian empire, but dimly outlined in these pages, to place that so very enterprising power in the front rank of the most progressive nations of the earth, it was fitting that the International Jury of the Exposition should present the testimonial of its high appreciation of the ministers of public instruction of domains, and of agriculture and public works, for their cordial and intelligent concurrence in the furtherance of this great work, and no less fitting that here, in this general survey of industrial education, we accord to Russia the well-earned honor of now standing foremost of the nations in this department.

GREAT BRITAIN.

Great Britain has been surprisingly slow, and, so far as the attempt has been made, rather unsuccessful in the department of agricultural education. In 1849 a school was established at Cirencester, with royal title, and with at first a promise of usefulness. The buildings were ample and substantial; the farm of seven hundred acres, though rather poor, tolerably well adapted to the purpose intended; the course of instruction given by six professors, some of them, as for example Dr. Volcker, eminent in the profession; and the need of such an institution generally recognized among the intelligent agriculturists of the kingdom. Nevertheless, the institution has never flourished in the best sense of that term, and is now half abandoned by even its friends. Whether its

failure to meet the expectation of its originators has been due to the form of its organization, or to that pertinacity of the English aristocracy which, so long as pupils from the middle and lower ranks in life attended the college, held back the sons of the nobility from participating in its benefits, or to the refusal of the government to grant the necessary aid, and the consequent high charges made for instruction, ($175 per annum,) or whether all these circumstances combined to prevent its success, there seems to be difficulty in determining. But the fact is undeniable that the institution languishes, while the few young men ambitious of a knowledge of scientific agriculture are found distributed among the schools of the continent.

Some little instruction is given in agriculture by professors in various institutions of scientific and technical character, but hardly sufficient in amount and importance to demand special attention.

In Scotland professional instruction in agriculture is confined to a single chair in the University of Edinburgh, and to special lectures given in a college at Aberdeen.

BELGIUM.

Belgium claims ten or twelve schools of agriculture, but most of them are either primary, intermediate, or connected adjunctively with communal colleges, and none of them have attained to any eminence.

Baden is credited, in like manner, with six schools of agriculture and forestry. Two of these, the Agricultural School of the Royal Polytechnic School at Carlsruhe being chief, are superior, the others intermediate or inferior.

CENTRAL GERMANY AND OTHER PARTS OF EUROPE.

Several of the duchies of Central Germany, including, especially, Saxe-Weimar, whose agricultural institute of the University of Jena is worthy of special notice, make liberal provision for agricultural education; their schools of different grades numbering in the aggregate not less than thirty.

Of the agricultural schools of other European countries established within more recent years, and in no way specially distinguished, I do not deem it important to speak in detail.

Sweden, Denmark, Italy, Spain, and Portugal have each recognized the importance of such institutions by the establishment of one or more schools, and even Greece and Turkey are now following the example of the other more advanced countries.

AGRICULTURAL EDUCATION IN AMERICA.

Although, by reason of the newness of the country and the cheapness of fertile lands, the establishment of schools designed to afford instruction in the applications of science to agriculture was here longer postponed than in some of the European countries, America has at last

entered into the movement with a spirit and energy that give promise of great results.

As early as 1837 prominent agriculturists began to agitate the question of creating State colleges of agriculture in the different States, either by direct appropriations from the public treasuries, or by joint efforts of people and governments; but nothing was actually accomplished in this direction until 1855, when the legislature of the State of Michigan, in obedience to a provision of the revised constitution expressed in these words, to wit, "The legislature shall encourage the promotion of intellectual, scientific, and agricultural improvement, and shall, as soon as practicable, provide for the establishment of an agricultural school," passed an act for the purchase of land and the endowment and management of the State Agricultural College of Michigan. Immediate steps were taken for the actual establishment of the institution by the purchase of six hundred and seventy-six acres of land near Lansing, the new capital of the State, and by the erection of a college edifice.

The institution was dedicated in 1857, and opened with a corps of seven professors and sixty-one pupils. The legislature this same year supplemented its former provision for endowment and support by a further appropriation of the proceeds of the sale of twenty-two sections of saline lands, (value $55,000,) and the sum of $40,000 per annum for the two ensuing years for necessary improvements and the support of the school. Afterward additional sums were appropriated, and the institution has since been in a steadily improving condition, with an average number of pupils somewhat less than one hundred.

The necessity for actual labor on the farm is a cardinal doctrine of this institution, and regulations for the enforcement of this part of the educational programme have the cordial support of its managers. Instruction is free to all residents of the State, and a moderate compensation for labor is given to those who perform it.

The declared objects are: firstly, to impart a knowledge of science, and its applications to the arts of life; secondly, to afford to its students the privilege of daily manual labor, that neither health nor inclination to labor may be lost, and that the principles taught in the school may be more firmly fixed in the mind; thirdly, to prosecute experiments for the promotion of agriculture; fourthly, to offer the means of a general education to the farming class.

Candidates for admission to the preparatory class must be at least fourteen years of age, and sustain a satisfactory examination in the necessary branches of an elementary education. The preparatory term of study is one year; the collegiate term, four years.

The number of professors is seven; the departments of instruction as follows: mathematics and civil engineering; English literature; general, analytical, and agricultural chemistry; botany; geology and mineralogy; zoology, general and descriptive; entomology; animal and vegetable

physiology; theory and practice of agriculture; theory and practice of horticulture.

The means of illustration independent of the farm, of which three hundred acres are under cultivation, and of the orchard, gardens, &c., include a chemical laboratory; the philosophical and mathematical apparatus usually found in our colleges; collections of animals, minerals, plants, and vegetable productions; and a library.

The degree of bachelor of science is conferred upon students who satisfactorily complete the full course of study, and the degree of master of science upon graduates of three years' standing who give evidence of having been engaged during that period in scientific studies.

Following the example of Michigan, the States of New York, Maryland, and Pennsylvania successively undertook, and early completed, the establishment of similar institutions; Pennsylvania, in particular, making large appropriations of money toward this object.

But it was soon found that the expense of founding and properly endowing valuable colleges of agriculture must necessarily be greater than the individual States—especially the newer States—were able to meet; and so, after due agitation of the question of national aid, running through a period of several years and engaging the earnest efforts of a great number of the agricultural, educational, and public men of the country, on the 2d of July, 1862—while the nation was still in the darkest hour of its struggle with the great rebellion—the act of Congress "donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts" became a law, and thus offered to each of the States not in actual rebellion the means of founding, or at least aid in founding, an institution of this class. Subsequently Congress very wisely so amended the original act as to enable *all* the States and Territories, without regard to their status at any former period, to avail themselves of the benefits it offered. Of the State agricultural colleges in actual operation or in process of establishment at the date of the act of 1862, all, except the State Agricultural College of New York, received from their respective States the national grants. But with those States in which no actual beginning had been made, the disposition of the grants involved so many difficult and perplexing questions that, even at the date of this writing, these questions are still discussed in many of the States, and without prospect of immediate settlement:

1. Shall we establish a separate and independent *agricultural college*, like most of those in the Old World and those of Michigan, Maryland, Pennsylvania, Iowa, Massachusetts, and Kansas, already in operation?

2. Shall we found a separate *industrial university*, like the new one just organized on the basis of the congressional donation in the State of Illinois, or like the Cornell University, also founded upon the national bounty, joined with the princely gifts of the noble friend of education whose name it bears?

3. Shall we establish an independent college by the side of an existing literary college, for the advantage it may confer by the regulated use of libraries, laboratories, collections, and scientific instruction already furnished?

4. Shall we bestow the gift upon some literary college; and, if so, upon what one?

5. Shall we bestow the grant upon some school of science or polytechnic school?

6. Shall we, by reorganization of our State university, create therein a college of agriculture and the mechanic arts in harmony with the other departments?

Such, in general, are the questions that have agitated, now agitate, and seem likely to continue to perplex the several States not provided at the outset with institutions toward which the national grants were drawn by a natural attraction.

And then, again, certain secondary questions, such as the advantage of a model farm connected with the agricultural school wherever established and however organized, and the necessity for manual labor on the farm as a part of the training of the pupils of such school, have in many, if not in all, cases entered into the main problem as a vital part of it, and so increased its complications. If, therefore, with the advantage gained by observation in other countries and a most careful study of the whole subject during a period of some twelve years, any light may be thrown upon these questions, or any of them, this present is certainly a fitting occasion for such an endeavor.

The first question in the above enumeration is practically answered in all cases where a use of the national grant is contemplated by the very terms of the act of Congress making the offer, which expressly provides for the endowment of a college "where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, * * * in order to promote the liberal and practical education of the industrial classes in their several pursuits and professions in life." It being thus demonstrable that no exclusive agricultural college is contemplated by the law, the question of separateness and independence is without force or application.

The second question involves a right conception of the law, but is based chiefly on the idea of separateness and independence, and implies serious objections to association with other institutions. Its answer must be determined by circumstances. If, as in the case of New York, there should be in existence no institution the location and character of which would render its conversion into an institution of the kind demanded easier and better than the foundation of such school in a new place, with munificent endowments otherwise unavailable, then the answer may be in the affirmative; but in the case of any State possessing such suitable institution the answer should be emphatically negative, for the great reason of economy, if for none other. The college of "agriculture and

the mechanic arts" necessarily covers a wide field, needing vast sums of money for its equipment; and scarcely any of our States are at present so rich in means that they can afford to disregard economical considerations. There is but little danger of any school of learning becoming more wealthy than is desirable, while, on the other hand, a stinted, crippled, and sickly institution had better not have existed at all.

The third question implies a recognition of the economy of association, but betrays a fear of too great intimacy—fear largely founded on ancient prejudice of class, which in America, last of all places on earth, should be allowed to take root, but also, to some extent, based on a misapprehension of what are the requisites of an agricultural school. If prejudices do exist between labor and learning, there is no reason why science and letters should not dwell peacefully together under the same generous roof.

If it be objected to the incorporation of the school of agriculture with a literary school, first, that a contiguous model farm would be impracticable in any given case, then I would say a model farm is not only not essential, but, so far as I have been able to determine, not half so valuable as we have been wont to suppose. If means were unlimited, there could be no harm in making a truly model estate, with its numerous establishments all complete—unless it should have the effect to make two-thirds of the pupils blindly, and often absurdly, attempt to follow it in their own future operations—but in most cases it would be better to employ the extra means upon the school itself and on the experimental farm than in vain endeavors to make a pattern capable of fitting every neighborhood in the State. The teaching of principles which are of universal application and the determination of principles by investigation and experiment, these are pre-eminently the mission of the agricultural college.

On this point the experiences of European countries and the opinion of the ablest and most enlightened scientific agriculturists of Europe are in accord; for, although the foreign schools of agriculture most widely distinguished are those which have model farms, it is only that they are the schools first established, and hence more widely known. A large majority of the superior schools established within the past ten years are associated with existing literary or scientific institutions, and have or have not a farm attached, as may be convenient or as may suit the ideas of the originator or patron of the enterprise. They are not deemed at all essential, if indeed, desirable, by those who have made the subject a study and are fully acquainted with the development of agricultural education.

From among the many high authorities on this subject I will merely cite Baron Liebig, who, by his important discoveries and remarkable writings on agricultural chemistry, has contributed more to the progress of agriculture and of agricultural education than any other man, and is so justly deemed the highest authority everywhere. It was on his recom-

mendation that I gave very particular attention to the Agricultural Institute of the University of Halle and other schools of its class—institutions furnished with the very best instruction in the mathematical, physical, and natural sciences, as well as in literature and philosophy, by professors connected with great universities, and simply possessing territory enough for the all-important experimental station, with its laboratories, amphitheaters for practical lectures, experimental grounds, gardens, stock-barns, &c. Under such a plan the out-door labor performed by pupils is no longer mere manual labor, as required on the model farm, but, when performed at all, is an incidental part of scientific investigations, and never irksome to the student. Other labor than what the pupils of enthusiastic teachers will voluntarily and with zest perform is unnecessary, besides being attended with positive embarrassment. If those who teach cannot, by their own example and by the expression of sentiments appreciative of the nobleness of industry and the dignity of intelligent labor, inspire their pupils with just ideas, vain is the arbitrary law that condemns them to the drudgery of routine labor in the fields.

The fourth question, if unqualified, may be safely answered in the negative, as in too many cases the interests of agriculture and the mechanic arts would be confided to men unacquainted with and wholly unappreciative of them. Association between scientific and literary departments, if upon terms of equality and fraternity, is desirable, but not otherwise. The friends of agriculture should make sure, therefore, in effecting consolidation with any institution of different character and aims, first, that the articles of association are wisely drawn; and, what is no less important, that the administration of the new and dual institution be confided to men of large, comprehensive, and impartial views.

But the fifth and sixth questions involve, as it seems to me, the most favorable conditions of success; for if there be in existence, and at a feasible place, a scientific or polytechnic school, the national grant would only give to it desirable expansion and further development; while, if there be a State university, the incorporation with it of the school of agriculture and the mechanic arts, on proper terms and conditions, would accomplish the two-fold object of building up and developing two important institutions of the State at one and the same time.

Influenced by considerations like these, the States of Rhode Island, Connecticut, New Hampshire, Vermont, New Jersey, Wisconsin, Kentucky, and Kansas have conferred the proceeds of the land grants upon scientific schools, departments, or colleges already existing or thus created in State universities or other public institutions sufficiently under their control; while, on the other hand, the States of Maine, Massachusetts, and West Virginia have established distinct and independent agricultural colleges.

New York, with the generous aid of her honored citizen, Ezra Cornell, whose gifts already nearly equal $1,000,000, has created a new university on a broad and generous plan.

Illinois has also created a new industrial university entirely apart from all other institutions of learning.

If to the views above expressed, in relation to the establishment and organization of agricultural schools, I were to add but one other word, it would be an appeal for the setting up of high standards of education for the agriculturist, and a warning against expecting large results from small means.

Two important reasons unite in support of the demand for high standards. First, agriculture as a profession embraces a vast field of study, and cannot be mastered in the brief period of one or two years, even by young men already disciplined and well informed by general study, much less by untutored pupils fresh from the farm and the district school. There is no reason why all who desire knowledge of agriculture should not, by proper gradation of courses of study—by practical courses and limited courses—be accommodated at the college of agriculture. But there are grave reasons why agricultural schools should not degrade the profession they seek to build up and establish in honor, by making the highest course of study they offer a limited one, and thus turning away from their halls and forcing into more honored professions the best endowed and best fitted young men of the country.

I would open the lecture-room to all, and grant certificates of proficiency to such as earn them; but the degrees of bachelor and of master should be held in reserve for such as aspire to professional honors and are willing to take up and go through more protracted and thorough courses of study to obtain them.

As to the requisite pecuniary means, the notion is too prevalent in this country that a few thousand dollars, say fifty to one hundred, should suffice for the establishment and equipment of an agricultural college—amounts less than equal to the annual income of some of the European schools of which account has been given in the preceding pages. The States should be made to understand both the importance and the cost of laboratories, libraries, ample means of illustration, and large corps of able, devoted, and fairly compensated professors; and not until there comes a recognition of all these as absolutely essential to success may we reasonably hope for institutions worthy of our agriculture and of our country.

III.—SCHOOLS OF FORESTRY.

In most European countries the possession of forests is a matter of so great importance that careful measures are taken by the governments to insure their preservation. In some of them—those whose resources are limited to small domains, and whose geographical position is such that they cannot depend on foreign countries for timber, as is the case with many of the interior German States—the necessity for such care in making the most of what they have, is even more imperative than the demand for economical culture of the soil. For, while bread-

stuffs may be imported in exchange for the products of mechanical industry, this is hardly true, to the same extent, of the more bulky products of the forest. And even the more extended and more richly endowed countries find it important to husband their resources as a means of security and increase of power. But the preservation of forests, while they are at the same time necessarily subject to exploitations carried on in the public interest, demands a knowledge of the conditions of the most economical use and reproduction. Not only so, the management of the forest as a part of either a private or public estate, so as to make the most of it as a source of wealth and at the same time keep it in all respects in the best possible condition, requires an amount of scientific and practical knowledge of which we in the New World have but a very imperfect idea. There, the forest is a precious gift, to be jealously watched by the police and cultivated with the best skill that science and patient study can supply; here, it is a barrier in the way of agricultural progress, and hence to be got rid of in the most summary manner—that is the difference.

How long it will be ere we come to look at practical questions with a wisdom that embraces the future in its calculations, I shall not assume to say; but I am certainly safe in asserting that unless we amend our course in forestry matters, as well as in agriculture and many other departments of American industry, the future will have just cause to reproach us with a recklessness and prodigality unparalleled in the history of enlightened nations.

Already, in many portions of our country not so bountifully supplied with forests as others, and especially in our vast prairie regions, the question of fuel and building timber is forcibly pressing the claims of forestry as an art and science upon the attention of individuals and industrial associations; but in very rare, if in any, cases has it gained the attention of the State governments any further than to secure the enactment of laws against trespass.

On the contrary, the European governments have gone far beyond the mere adoption and enforcement of regulations, however wisely planned, against improvidence and unlawful use, in making provision for careful and thorough training of young men for both public and private service in what has thus been made the science and profession of forestry.

In every school of agriculture this science has always been taught; and in many it is treated as the equal of agriculture, both in the degree of its importance and the extent of the courses of instruction provided.

So, likewise, forestry constitutes either a distinct school, or at least an extended course of study, in a great number of the polytechnic schools; reference to the chapter on which is here made for the satisfaction of those who may wish to examine into the nature of the provision for such instruction in schools of that class. As affording the best examples of forestry schools thus incorporated, special attention is called to the schools at Carlsruhe, Zurich, and Tharanadt. The last-

named was, for many years after its establishment, exclusively a school of forestry, the agricultural department having been since added.

As an example of the separate schools of forestry, of which there are several distributed among the states of Germany, Austria, and Russia, I shall more especially notice the one possessed by France.

The *Éeole Impériale Forestière* at Nancy, in the department of Meurthe, has been in existence for several years. It is under the control of the minister of finance, and has for its object the preparation of young men for the service of the administration of the government forests.

The government regulations require of the candidate for admission presentation of satisfactory evidence that the applicant is of French nativity or has been naturalized; that he is between the ages of eighteen and twenty-two years; that he is possessed of a strong and healthy constitution; that he has graduated as bachelor of science, or has completed a course of study in the classical section of a lyceum as far as to and including rhetoric; together with a legal obligation to pay the sum of 1,500 francs for board, besides the expense of his wardrobe during the two years of attendance upon the school; and an annuity of 600 francs from the conclusion of his studies up to the moment of being called into the public service. Having given satisfaction on these several points to the director-general of the administration of forests, the applicant then receives authority from that official to present himself at the competitive examinations, which are both written and oral.

The oral examinations bear upon arithmetic, algebra, geometry, descriptive geometry, trigonometry, physics, chemistry, cosmography, mechanics, botany, history, geography, and the German language. Conformably to official programmes candidates must also present to the examiners twelve sheets of design of such nature as may be required.

The written examinations are six in number, including mathematics, especially trigonometry and logarithmic calculations, French narration, dictation in French, drawing, linear design, and broad color-washing.

On arriving at the school the successful candidate must undergo examination by a surgeon, to make sure that he possesses no infirmity or tendency to disease that would interfere with the duties of forestry.

The course of study occupies two years; the subjects embraced being, in general terms, as follows: surveying, topography, geology, agricultural chemistry, drawing, design of plans, general and agricultural botany, excursions into the forests for practical observation, valuation of timber, cosmography, petrography, forestry, entomology, construction of roads and hydraulic works, culture of forests, exploitations of forests and the direction of them, forestry statistics, general management of forests, knowledge of the forests belonging to the empire.

On completing the course of study, and passing the final examination, the student is graduated with the title of keeper-general of forests, and is entitled to enter the service as soon as a vacancy occurs.

This school is also open to day pupils complying with the regulations as to examination, &c.

It may not be necessary for the United States to have independent schools of forestry, like the *École Impériale*, but it is unquestionably important that forestry should receive more attention from both State and national governments, and that such provision should be made for instruction therein by all our colleges of agriculture and the mechanic arts as shall insure a better future appreciation of the economical interests it represents.

IV.—VETERINARY SCHOOLS.

Veterinary science is not only now considered an essential part of the instruction in every well-appointed agricultural school, but numerous independent schools, liberally endowed and fully equipped, have been established in various parts of the world. Those of which I have gained personal knowledge by inspection, and which are generally regarded as first in importance, are located at Alfort, Lyons, Toulouse, London, Turin, Ferrara, Bologna, Vienna, and Berlin. Of these, the French schools at Lyons and at Alfort are the best organized and probably the most completely furnished. The Lyons school was established in 1762, and has long enjoyed a world-wide reputation. But, of late years, the institution at Alfort has attained a rather higher rank, and in this report will be taken as the representative of its class. Both of these schools, together with a third located at Toulouse, which I did not visit, are maintained at the expense of the government. They are under the control of the minister of agriculture, of commerce, and of public works, and have for their object the education of young men of suitable qualifications in the science and art of veterinary medicine and surgery for the military service and for private practice.

It is necessary that the candidate for admission to either of the French schools should be not less than seventeen years of age nor more than twenty-five, and conform to the usual requirements as to location, his having been vaccinated, &c. Such as have been authorized by the minister of agriculture to present themselves at the institution, before admission as pupils, are required to pass examination in the French language, arithmetic, geometry, geography, and history. They board within the institution, at a cost of 450 francs per annum. These institutions are provided with all needful buildings for the accommodation of pupils and professors, a large number of hospitals for domestic animals, libraries, and extensive collections in natural history and pathological anatomy.

The faculties each consist of a director, who, beside having general direction of the institution and supervising its affairs, gives instruction in some one of the departments, and five or six professors, with a number of assistants. Some of the professors have European reputations

and are doing much by their investigations to advance veterinary science.

The term of study is four years and embraces courses of instruction in general and animal chemistry; veterinary zoology; anatomy, and physiology; botany and materia medica; the theory and practice of veterinary medicine and surgery; practical exercises in the hospitals of the institution, and in the art of horse-shoeing; history and literature of veterinary medicine.

The Italian schools, located at Turin and Milan, and founded shortly after the French schools, are now in a flourishing condition, and under the new regime of Victor Emanuel, bid fair to become rivals of those of France. They are sustained by the government, and are just now being improved by the addition of new constructions, and the enlargement of old ones. The plan of organization and the system of management are quite like those of the French schools. They are under the control of the minister of public instruction, however, instead of the minister of agriculture, as in France, the general management being intrusted to a director. Their immediate economical administration devolves upon a secretary, (*segretario economico,*) by whom the director is wisely relieved of much of the care often imposed upon such officers.

The instruction is theoretical and practical, and occupies a period of four years.

The subjects taught, with the number of lessons per half-year given in some of the most important studies, are as follows:

First year, winter term: External conformation of animals, 20 lessons; anatomy and physiology, 69 lessons; theoretical horse-shoeing, 16 lessons; anatomical dissections.

First year, summer term: Botany, 31 lessons; anatomy and physiology, 76 lessons; practical horse-shoeing; zoology, 30 lessons; dissections.

Second year, winter term: Breeds of animals, 22 lessons; general chemistry, 16 lessons; hygiene, 45 lessons; anatomy and physiology, 69 lessons; theoretical shoeing, 16 lessons; surgical clinics; practical shoeing; dissections.

Second year, summer term: Medical clinics; general chemistry, 46 lessons; surgical clinics; anatomy and physiology, 76 lessons; dissections; hygienic and botanical excursions.

Third year, winter term: Pharmacy, 53 lessons; medical pathology, 18 lessons; medical clinics; surgical pathology, 48 lessons; surgical clinics; operative surgery, once a week, three hours.

Third year, summer term: Medical pathology, 66 lessons; medical clinics; surgical pathology, 45 lessons; surgical clinics; materia medica, 52 lessons; veterinary history, 10 lessons; surgical pathology, 19 lessons; surgical visits; operative surgery, once a week, three hours; botanical excursions.

Fourth year, winter term: Medical pathology, 18 lessons; medical

clinics; surgical pathology, 48 lessons; surgical clinics; operative surgery, once a week, three hours.

Fourth year, summer term: Medical pathology, 66 lessons; medical clinics; surgical pathology, 64 lessons; surgical clinics; surgical visits; operative surgery.

The medical clinics always occupy one hour a day; the surgical, two hours.

The average number of horses treated in the hospital being six hundred per annum, and the total number treated in the hospital and in the neighborhood being twelve hundred per annum, it will appear that excellent facilities are furnished to pupils for acquiring a knowledge of both medical and surgical practice.

Most of the more recently established schools of veterinary science in European countries are founded in connection with the universities, those of Ferrara, Bologna, and Berlin, in the list above given, being of this class. Inasmuch as the whole groundwork of principles is essentially the same in general medicine and in veterinary science, and since the universities embracing medical faculties—as nearly all do—necessarily teach those principles, and moreover present, in their chemical and physiological laboratories, museums of comparative anatomy, and collections in materia medica, extraordinary facilities for gaining a knowledge of this special science, it will not be surprising if veterinary schools spring up by the side of schools of general medicine in all countries.

Thus far, Italy has taken the lead in this important movement, having, within recent years, in addition to those I visited at Bologna and Ferrara, established others in connection with the university at Naples and with the free universities of Urbino and Perugia.

The course of instruction in *corso di veterinaria* of the Italian university embraces scientific lectures and demonstrations, with clinical examinations and practical medicine and surgery in the veterinary hospital, always a part of the institution. By attendance upon the lectures given in the medical department of the university, the student has the full benefit of the instruction of an able corps of sixteen to twenty professors. The studies taught are the following, to wit: chemistry, inorganic and pharmaceutical; botany; materia medica; pharmacy; anatomy of man; general comparative anatomy; anatomy of the domestic animals; human and veterinary physiology; general pathology; veterinary pathology; surgical pathology; veterinary medicine; veterinary surgery; veterinary obstetrics; veterinary hygiene; conformation of different breeds of domestic animals; pasturage; stall feeding; construction of stables; rural economy; veterinary police; veterinary jurisprudence; and horseshoeing. The clinics are, of course, both medical and surgical.

VETERINARY COLLEGE OF PRUSSIA.

The Royal Veterinary College of Prussia was founded by the government in 1796 as a separate school, but has been just recently attached

to the university. It is pleasantly located in the suburbs of Berlin, and besides the ancient buildings of different kinds has, of late, been favored with the addition of neatly constructed hospitals, anatomical and pathological museum, laboratories, &c., erected in the adjoining park. The college is under the immediate management of a director, and the instruction is given by six regular professors, with assistants; the students also having access to certain lectures in the university.

The following programme of studies shows at once the branches taught and the order of occurrence:

First year, winter semester: Anatomy; elements of physics and chemistry; horse-shoeing; smithing; zootomy.

First year, summer semester: Natural history; botany; physiology; materia medica; review of horse-shoeing; smithing; lessons in the apothecary shop; instructions in smithing.

Second year, winter semester: Surgery, (part 1;) chemistry; special pathology and therapeutics, (part 1;) general pathology and therapeutics; review of materia medica; zootomy, (part of semester;) pharmacy; smithing.

Second year, summer semester: Surgery, (part 2;) rearing domestic animals; physics; special pathology and therapeutics; review of general pathology and therapeutics; pharmacy and smithing.

Third year, winter semester: Anatomy; pathological anatomy; cattle, sheep, and swine breeding; encyclopedia and history of veterinary science; review of special pathology and therapeutics, (part 1;) practical operations; clinics.

Third year, summer semester: Care and management of a stud; exterior of domestic animals; veterinary jurisprudence; review of special pathology and therapeutics; clinics in the institution; perambulatory clinics.

Fourth year, winter semester: Cyclopedia and history of veterinary science; college and perambulatory clinics.

The total annual expenses of the college are about $24,000. The students not sent to the institution with a view to army service pay $12 each per semester as tuition. The number of students in 1867 was 160; of whom 40 were civil and 120 military pupils.

SPAIN.

Spain has a high veterinary school at Madrid, with branches at Saragossa and Cordova, and several others exist in various parts of Europe.

UNITED STATES.

Recent attempts have been made in the United States to establish veterinary schools in two or three of the large cities; but as yet none of them, so far as I have information, can be said to have an established and recognized existence. Veterinary science will doubtless be taught in all the State colleges of agriculture and the mechanic arts, and so

measurably supply this lack; but there certainly ought to be at least one well-equipped school of this kind in the whole country.

V.—SCHOOLS OF MINES.

The mineral resources of most countries constitute so large a part of their available wealth, and are withal commanded with so much more difficulty than any other form of material wealth, that they demand alike the aid of science and the best exercise of inventive genius. It is, therefore, not surprising that the art of mining was one of the first during the latter half of the last century to avail itself of the aid of the sciences of chemistry, mineralogy, and geology. Previous to that time experience was the only guide in the search for, and extraction of, the hidden treasures of the earth, and hence incalculable amounts were spent in every mineral-producing country in fruitless endeavors to obtain them under impossible conditions.

Like that of agriculture, the art of mining is complex, including many subordinates, and borrowing extensively from other arts, and deriving aid from several branches of science. It is one thing to determine the position and extent of a deposit, and another to penetrate the rocky crust of the earth for its extraction; to expel the noxious gases that would destroy the life of the miner; to conquer the floods of water that often deluge the mine; to raise the precious mineral from incredible depths; and, when at last brought to the surface, to smelt, refine, and prepare it for the use of man.

AUSTRIAN MINING SCHOOL AT CHEMNITZ.

The first one of the important special schools of mines now found in Austria, Saxony, Prussia, France, Great Britain, Russia, and perhaps in some of the other European states, was established by Maria Theresa, at Chemnitz, Hungary, in the year 1760. Remarkable for the great number, variety, and value of its mines of gold, silver, copper, lead, iron, sulphur, and arsenic, this locality had for centuries held a leading position among the mining districts of Europe, and was the most natural place for beginning the cultivation of a science of mining.

This school has thus, for more than a hundred years, continued to shed its light upon the dark and difficult way of the miner, and still holds an honored place among the most useful institutions of its kind in the world. It is liberally supported by the government of Austria, and annually numbers over two hundred students.

MINING ACADEMY, SAXONY.

The Saxon Academy of Mines, founded in 1766, was also established in the midst of important silver and other mines. By reason of having taught, and then for a long time been conducted by, the illustrious Werner, first geologist of his time, it has even gained a higher distinction

than the Hungarian school. At the present time it is under the general direction of the minister of finance; its supervision being intrusted to the directory of mines. Its primary object is the education of young men for the corps of mines of the state; but other young men, residents of Saxony and foreigners, also attend. Indeed, nearly every country of Europe, as well as the United States and Brazil, has pupils there. The requisites for admission are an age between sixteen and twenty-three years, good moral character, sound health, ability to write the German language correctly, acquaintance with Latin sufficient for the ready translation of easy authors, and a good knowledge of geography, history, arithmetic, elements of geometry, and drawing.

Candidates are thoroughly examined, and such as intend entering the corps of mines—to whom the instruction and support are free—must furnish satisfactory guarantees that in case they eventually enter another profession they will return to the institution the expenses of their education therein. Besides free tuition, &c., these candidates receive pay from the government amounting to from $10 to $30 per annum—the amount increasing from the first to the end of the third year—as further encouragement. During the fourth and last year of study in the academy, the candidate receives simply compensation for service in the mines.

Pupils, other than candidates, pay a trifling tuition fee, and are not held to the full four years' course of study; the classification being so arranged as to meet the wants of those who are to engage in different branches of the mining business. For the sake of economy of time and instruction, the studies are so ordered that during the period of the first or general course they may be pursued by all in common. After that the candidates take up the more strictly professional studies, pursuing these partly in common until the beginning of the fourth year, when the paths of the miner and the metallurgist entirely separate, so far as the practical branches are concerned. If any desire to qualify themselves to the utmost for the corps, they must master both departments, mining and metallurgy.

The general course embraces pure and applied mathematics; mechanics and mining machinery; general, analytical, and technical chemistry; physics; mineralogy; geology; crystallography; drawing, general and topographical; shadows and perspective; drawing of mining implements, machines, and mining-constructions; metallurgy; mining as an art; civil engineering; mining jurisprudence; correspondence; and the French language.

The professional course is as follows:

First year: Mathematics, physics, geology, general and topographical drawing, French language, practical operations in the mines and at the furnaces, under the direction of foremen competent to instruct.

Second year: Higher mathematics, general chemistry, mineralogy, practical exercises in chemical and mineralogical laboratories, crystal-

lography, drawing, civil engineering, the art of mining, practical mining, and geological excursions.

Third year: Applied mathematics, analytical chemistry, technical chemistry, metallurgy, the art of mining, practical mining, geology, with practical exercises.

Fourth year: Machinery of mines, analytical and technical chemistry, theory and practice of mining, practical exercises in mining and metallurgy, practical exercises in general geology and paleontology.

The instruction is given by 13 professors, with the aid of valuable auxiliaries, including the collection of minerals left by Werner, a general geological and mineralogical cabinet, a chemical and physical laboratory, a large and valuable collection of models of mining implements, machines, and constructions, and a library of some 20,000 volumes. When I visited the school (June, 1867) there were some 200 students reported in attendance.

PRUSSIAN MINING SCHOOLS.

The Prussian schools are also in a like flourishing condition. The most important of them are located at Clausthal, in Hanover, and at Berlin. The one at Clausthal has a government mint connected with it for assaying and coining the precious metals produced.

SWEDEN.

Sweden has two mining schools, one at Filipstad, and one at Falun. The first named is an elementary school, controlled and directed by the mining association. Pupils—of whom the number in 1867 was 20—pay an admission fee of 4 rixdollars, and 50 rixdollars for tuition. The branches taught are theoretical and practical geometry, plane trigonometry, physics, mechanics, linear drawing, leveling, chemistry, geology, mineralogy, and metallurgy. The pupils are often taken to neighboring mines, furnaces, and other works for practical instruction.

The school at Falun is about being incorporated with the Royal Polytechnic School at Stockholm. It is supported, in part, by the mining association, and partly by government, which at present annually appropriates 9,700 rixdollars to that object.

In Norway instruction in mining and mining engineering is given at the university; besides which there is an elementary school like that in Sweden above referred to.

RUSSIA.

The Imperial School of Mines at St. Petersburg is one of the finest theoretical schools of the kind in Europe. I say theoretical, because, unlike those above noticed, it is not located in a mining district. It is amply provided with laboratories for metallurgical operations, however, besides having a very large and rich collection of the minerals of Russia, collections of models, &c., and, underneath the magnificent edifice it

occupies, a counterfeit mine of considerable extent and great interest. The course of instruction is ample and thorough, occupying eight years, and being given by 36 professors to regular classes, numbering 250 pupils.

Besides this noble central institution, Russia has ten others of secondary grade, and nearly a hundred primary mining schools in the various mining districts of the empire. The corps of miners is a branch of the public service, and includes many of the ablest and most scientific men of the country.

FRANCE.

The *École Impériale des Mines* of France, located at Paris, is likewise an institution of great importance and of high reputation. It is designed to prepare graduates from the Imperial Polytechnic School for the public service. Pupils not from the polytechnic school are also admitted if possessed of high qualifications; but these are only fitted to direct practical mining exploitations and metallurgical establishments and cannot enter the service of the state. The term of study is three years; tuition free.

Applicants for admission, not graduates of the polytechnic school, must show that they have attained the age of seventeen years, and were not more than twenty-three on the first of January preceding application; that they are French, either by birth or naturalization; that they are of good moral character, &c.; and must satisfy the examiners that they are proficients in infinitesimal analysis, mechanics, descriptive geometry and its applications, physics—so far as it relates to gas and to optical instruments—general chemistry, and geometric design. The ability to write a fair, legible hand and correct orthography are also demanded. The examinations are conducted, in the several departments where this class of pupils reside, by engineers of mines designated by the minister of agriculture, commerce, and public works, under whom the school is placed. Polytechnic pupils and licentiates of mathematical science are not examined for admission. There is a preparatory course, of one year, for the benefit of such applicants as, being otherwise desirable pupils, are not quite able to pass the requisite examination.

There are also two other schools for instruction in mining in France—a school of miners at St. Etienne, designed to form directors of mining and of metallurgic operations and superintendents of mines, and in which the term of study is also three years; and a school of master miners, situated at Alais, whose object is to form foremen, who shall possess at the same time sufficient practical knowledge to enable them to supervise the labor of workmen, and theoretical knowledge enough to execute the orders of a director of exploitations. In this school of master miners the term of study is two years. A number of bursaries, created by the state, are conferred in preference on miners or the sons of miners.

GREAT BRITAIN.

Great Britain, although the leading mineral-producing country of the world, has been neglectful in the matter of providing schools for the instruction of its miners in the principles of the art. As early as 1839 the distinguished Sir Henry de la Bèche, then Secretary of the Geological Society, and afterward Director General of the Geological Survey of the United Kingdom, opened a course of lectures on the science and art of mining, which at last, in 1851, became the government School of Mines, of which the scientific men of the kingdom are now justly proud. Being associated in the same building with the Museum of Practical Geology, the Mining Record Office, and offices of the Director General of the Survey of the kingdom, it possesses extraordinary advantages for giving theoretical instruction.

The corps of instructors includes able lecturers on geology, mineralogy, chemistry, paleontology, physics, mechanics, natural history, mining and metallurgy, topographical and mechanical drawing. Besides the lectures, there are frequent examinations, as well as regular practice by such students as intend to devote themselves to the profession, in the chemical and metallurgic laboratories. Many of the lecturers are leading men in their respective departments; and not a few of the pupils, who have gone from this school into practical service, have won for it and for themselves much credit by their success.

UNITED STATES.

In the United States we have as yet no separate school of mines; but several schools and courses in mining have been lately established in connection with existing institutions, as, for example, with the Massachusetts Institute of Technology; the Scientific School of Harvard University; the Sheffield Scientific School of Yale College; Columbia College at New York; the Rensselaer Polytechnic School at Troy, New York; with the Polytechnic School of the State of Pennsylvania, located at Philadelphia; and with the University of Michigan. The State of California is at present laying the foundation for a school of mines, as a leading branch of its Agricultural, Mining, and Mechanical Arts College, endowed in part with the national land grant of 1862.

The term of study in the several schools of mines now in operation varies from two years (which is the period in most of the polytechnic schools) to three and four years, the term for most of those connected with the higher colleges and universities. The minimum age at which pupils may be admitted is sixteen years; no maximum age being fixed. The fees for tuition and use of laboratories range between $125 to $200 per annum. The collegiate year, in most cases, begins about the 1st of October, and ends with the 1st of June or the 1st of July.

The educational fitness required may be said, in general terms, to be a fair acquaintance with the branches taught in the public high schools of the country, exclusive of the ancient languages.

THE SCHOOL OF MINES OF COLUMBIA COLLEGE, NEW YORK.

This school of mines was established in 1864, for the purpose of furnishing to students the means of acquiring a thorough knowledge of those branches of science which form the basis of the industrial pursuits that are to play the most important part in the development of the resources of our country.

The system of instruction followed in the school includes four parallel courses of study, viz:

I. Mining engineering.
II. Metallurgy.
III. Geology and natural history.
IV. Analytical and applied chemistry.

A fifth course, in civil engineering, will be introduced at the beginning of the next academic year, in October.

The school is provided with fine mineralogical and geological collections; physical, mechanical, engineering, and mathematical instruments and models; chemical and physical apparatus; chemical and metallurgical laboratories; and a scientific library and reading-room.

These are all sustained by liberal annual appropriations, which enable the professors to rapidly increase these important means of illustration and practical instruction.

Communication has been established with kindred institutions in Europe, and very valuable additions to the cabinets and library have already been received from France, Germany, and Russia.

The success of the school of mines has surpassed the most sanguine expectations of its projectors. The average number of pupils for the past three years has been about one hundred, of whom about one-third are college graduates.

Although the school has been in existence but five years, it has already sent forth thirty-four graduates, most of whom have been already appointed to responsible positions as mining engineers, metallurgists, geologists, chemists, or professors.

The officers of the school, most of whom were educated in Europe, are satisfied that the school now offers to American students every facility necessary so enable them to prepare themselves for any of the professions which involve the practical application of the branches of science therein taught; and that it is no longer necessary for young men to visit Europe to study applied science; in fact, that they can be better fitted here *for this field of labor*, which is characterized by peculiar conditions of labor, transportation, &c.

The school is under the presidency of F. A. P. Barnard, S.T.D., LL.D., and has nine professors, and the same number of instructors and assistants. The list of professors includes the names of gentlemen highly distinguished in science for their original investigations and contributions in their several departments.

THE PLAN OF INSTRUCTION.—The plan of instruction pursued in the

school includes lectures and recitations in the several departments of study; practice in the chemical and metallurgical laboratories; projects, estimates, and drawings for the establishment of mines, and for the construction of metallurgical and chemical works; reports on mines, industrial establishments, and field geology.

The course of instruction occupies three years. Those who complete it receive the degree of engineer of mines or bachelor of philosophy. There is a post-graduate course of one year for the degree of doctor of philosophy.

For candidates not qualified to enter the first year, a preparatory year has been added.

The year is divided into two sessions. The first commences on the first Monday in October; the second on the first Thursday in February. The lectures close on the first Friday in June. The annual examinations are then held on all the studies of the year.

The method of instruction is such that every pupil may acquire a thorough theoretical knowledge of each branch, of which he is required to give evidence at the close of the session by written and oral examinations. At the commencement of the following year he is required to show, from reports of works visited, that he not only understands the theoretical principles of the subjects treated, but also their practical application.

SYNOPSIS OF STUDIES, FIRST YEAR.—*First session:* Analytical geometry,[1] descriptive geometry, inorganic chemistry,[2] qualitative analysis, crystallography, blowpipe analysis, botany, French, German, drawing.

Second session: Calculus,[1] descriptive geometry, organic chemistry,[2] qualitative analysis, blowpipe analysis, zoology, French, German, stoichiometry, drawing.

Memoir and journal of travel during the summer vacation.

SECOND YEAR.—I. For mining engineering students: Mechanics, mining engineering, quantitative analysis, metallurgy, geology, mineralogy, mathematical physics, drawing. II. For students of metallurgy: Quantitative analysis, metallurgy, geology, mineralogy, drawing. III. For students in geology and natural history: Quantitative analysis, metallurgy, geology, mineralogy, drawing. IV. For students in analytical and applied chemistry: Quantitative analysis, metallurgy, geology, applied chemistry, drawing.

Memoir and journal of travel during the summer vacation.

THIRD YEAR.—I. For students of mining engineering: Mining engineering, assaying, economic geology, metallurgy, quantitative analysis, drawing, project. II. For students in metallurgy: Assaying, economic geology, metallurgy, quantitative analysis, lithology, drawing, project. III. For students of geology and natural history: Economic geology, lithology, paleontology, drawing, dissertation. IV. For students of

[1] Optional for students of the geological and chemical courses.

[2] Optional for students of the mining engineering course.

analytical and applied chemistry: Assaying, economic geology, metallurgy, quantitative analysis, applied chemistry, drawing, dissertation.

POST-GRADUATE COURSE, PREPARATORY YEAR.—*First session:* Geometry, physics, chemistry, French, German, drawing.

Second session: Algebra and trigonometry, physics, chemistry, French, German, drawing.

MATHEMATICS.—The course in mathematics in the preparatory year embraces algebra, so far as to include the general theory of equations; geometry, plane, volumetric, and spherical; trigonometry, plane, analytical, and spherical; mensuration of surfaces and of volumes. In the first year, analytical geometry of two and three dimensions; differential and integral calculus; differentials of algebraic and transcendental functions; successive differentials; maxima and minima; transcendental curves; curvature; integration of regularly formed differentials; integration by series; integration of fractions; special methods of integration; rectification of curves; quadrature of surfaces; cubature of volumes.

PHYSICS.—The students of the preparatory year are occupied during the first term with the subject of heat, including the steam-engine, while the second term is employed in the study of voltaic electricity, magnetism, and electro-magnetism. These courses of lectures are fully illustrated by appropriate experiments; the instruction is conveyed by lectures and recitations, practical problems being occasionally proposed for solution.

During the second year courses of lectures are delivered on the laws of electro-dynamics, on the mechanical theory of heat, on mathematical optics, and on the undulatory theory of light. Portions of these courses are accompanied by experimental demonstrations.

The cabinet of physical apparatus will rank with the best on this continent, and extensive additions are made to it each year.

MECHANICS.—This subject is taught during the second year. The course of instruction embraces the following subjects: Composition and equilibrium of forces; center of gravity and stability; elements of machinery; hurtful resistances; rectilinear and periodic motion; moment of inertia; curvilinear and rotary motion; mechanics of liquids; mechanics of gases and vapors; hydraulic and pneumatic machines.

DRAWING AND DESCRIPTIVE GEOMETRY.—During the first session of the preparatory year the student is taught to execute topographical maps. He is first instructed in the use of the pen to delineate lines of level, shaded with lines of declivity, and completed with the conventional signs of different features, such as water, forests, marshes, cultivated ground, outcrops of veins, &c.; subsequently he is taught to represent the same in shading of india ink or sepia, with the application of the conventional signs and colors used by our government and civil engineers. During the second session the course of instruction includes sketching in pencil from plane models and from nature; afterward colored sketches or landscape drawing in water colors.

During the first year descriptive geometry is taught. The course of instruction includes the study of Davies's treatise on this subject, with lectures and blackboard exercises illustrated by Olivier, and other models, showing the more difficult problems of intersections and the generation of warped surfaces.

The instruction in drawing includes the use of mathematical instruments in constructing on paper the problems of descriptive geometry.

During the second session graphics are taught, including the study of Davies's Shades and Shadows, and Perspective; and Mahan's Stone Cutting, with explanatory lectures; the exhibition of models; and the solution of various new problems of shades and shadows.

The course in drawing includes instruction and practice in the use of instruments; the pen and brush, with india ink, in drawing mathematical forms in projection and perspective; shading them; casting their shadows, and washing them. This is followed by an application of the principles learned to the execution of a drawing of a machine, or the section of a furnace, wherein the shadows are accurately calculated and washed, and the drawing is appropriately colored.

In the second year the course includes, during the first session, the drawing of machines, mills, furnaces, &c., from plane models. These are shaded, their shadows calculated and cast, and the whole properly colored. The dimensions are also quoted, so that these drawings serve as types of working drawings.

During the second session the students draw from various models in relief, chiefly furnaces and machines. They first make a free-hand sketch from the relief, and upon it place the dimensions which they measure; subsequently they draw the finished representation, in the academy, to a proper scale, with shades, shadows, colors, and dimensions. This practice is of benefit in accustoming the student to take rapid sketches of established works, upon which he may be required to report, or by which he may wish to inform himself.

MODERN LANGUAGES.—The design in this department is to teach the student how to read French and German scientific books with facility.

Instruction is given for two hours a week in each of these languages, during two years; and as the text-books employed in the class-room are altogether works on science, the students can acquire a sufficient vocabulary to enable them to use French and German authors in all the departments of the school.

No attempt is made to produce accomplished scholars in all branches of German and French literature, but attention is concentrated upon the immediate wants of the young men. In this way no time is lost, and the instruction becomes thoroughly practical.

GENERAL CHEMISTRY.—The preparatory class attend three exercises a week in general chemistry throughout the year. It is intended to lay the foundation of a thorough knowledge of the theory of the subject preliminary to the practical instruction in the chemical laboratory. For

this purpose the class is drilled upon the lectures, with free use of the best text-books. The students are expected to write out full notes, which must be exhibited to the professor at the close of each session. At the end of the year the class must pass a rigid examination before they can be admitted to a higher grade.

The first year students also attend three times a week, during the year, in general chemistry, and receive instruction in the chemical properties of the metals and of their compounds; they also have a course in organic chemistry, adapted to the wants of special scientific students. The text-book for reference in this department is Roscoe's Chemistry, English edition, 1869; and the notation adopted is in accordance with the unitary atomic system.

ANALYTICAL CHEMISTRY.—There are two laboratories devoted to qualitative analysis, and one of larger size to quantitative analysis, besides the assay laboratory. These laboratories are provided with all the necessary apparatus and fixtures, and each is under the special charge of a competent assistant. Each student is provided with a convenient table with drawers and cupboards, and is supplied with a complete outfit of apparatus and chemical reagents.

During the first year qualitative analysis is taught by lectures and blackboard exercises, and the student is required to repeat all the experiments at his table in the laboratory. Having acquired a thorough experimental knowledge of the reactions of a group of bases or acids, single members of the group or mixtures are submitted to him for identification. He thus proceeds from simple to complex cases till he is able to determine the composition of the most difficult mixtures. Constant use is made of the spectroscope in these investigations.

When the student shows, on written or experimental examination, that he is sufficiently familiar with qualitative analysis, he is allowed to enter the quantitative laboratory.

During the second and third years quantitative analysis is taught by lectures and blackboard exercises, and the student is required to execute in the laboratory, in a satisfactory manner, a certain number of analyses. He first analyzes substances of known composition, such as crystallized salts, that the accuracy of his work may be tested by a comparison of his results with the true percentages. These analyses are repeated till he has acquired sufficient skill to insure accurate results. He is then required to make analyses of more complex substances, such as coals, limestones, ores of copper, iron, nickel and zinc, pig iron, slags, technical products, &c.; cases in which the accuracy of the work is determined by duplicating the analyses, and by comparing the results of different analysts.

Volumetric methods are employed whenever they are more accurate or more expeditious than the gravimetric methods. In this way each student acquires practical experience in the chemical analysis of the ores and products which he is most likely to meet in practice.

STOICHIOMETRY.—Stoichiometry, the arithmetic of chemistry, is taught in a special course of lectures and blackboard exercises during the second session of the first year.

ASSAYING.—During the third year the student is admitted to the assay laboratory, where he is provided with a suitable table and a set of assay apparatus, and where he has access to crucible and muffle furnaces, and to volumetric apparatus for bullion assay by the wet process. The general principles as well as the special methods of assaying are explained in the lecture room, and at the same time the ores of the various metals are exhibited and described. The student is then supplied with suitable material, ores of known composition, and is required to make assays himself. He first receives ores of lead, the sulphuret, carbonate, and phosphate, which he mixes with the proper fluxes, and heats in the furnace, obtaining a button of lead which he carefully weighs, thus determining the percentage of metal in the ore. He then determines by cupellation the amount of silver in the lead. Silver ores are next given to him, at first those which are most easily assayed, such as mixtures of chloride of silver with quartz; afterward more complex ores, such as galena, ruby silver ore, mispickel, fahlerz, &c. These he is required to assay both in the crucible and in the scorifier. Ores of gold are next supplied, auriferous quartz, slates, pyrites, blende, &c., which are assayed by the most reliable methods.

To facilitate the assay of ores of the precious metals a system of weights has been introduced, by which the weight of silver or gold globules obtained in the assay shows at once, without calculation, the number of troy ounces in a ton of ore.

The student then passes on to the assay of silver and gold bullion, the former by Gay-Lussac's volumetric method, the latter by "quartation" or "parting" Ores of tin, antimony, and iron are then assayed in the dry way, when the course is completed. Each student thus executes two or three hundred assays himself, under the immediate supervision of the instructor.

APPLIED CHEMISTRY.—The instruction in applied chemistry extends through the second and third years, and consists of lectures, illustrated by experiments, diagrams, and specimens. The subjects discussed are:

I. Chemical manufactures—acids, alkalies, and salts.

II. Glass, porcelain, and pottery.

III. Limes, mortars, and cements.

IV. Fuel and its applications.

V. Artificial illumination—candles, oils, and lamps, petroleum, gas, and its products.

VI. Food and drink—bread, water, milk, tea, coffee, sugar, fermentation, wine, beer, spirits, vinegar, preservation of food, &c.

VII. Clothing—textile fabrics, bleaching, dyeing, calico printing, paper, tanning, glue, India-rubber, gutta-percha, &c.

VIII. Artificial fertilizers, guano, superphosphates, poudrettes, &c.

IX. Disinfectants, antiseptics, preservation of wood, &c.

MINERALOGY.—The studies in the department of mineralogy continue through two years. In the first year the students are instructed in crystallography and the use of the blowpipe. The lectures on crystallography are illustrated by models, which the students are required to determine under the eye of the professor. A collection of glass models, and of models in wood, illustrating all of the important actual and theoretical forms, is always accessible to the students. The exercises in blowpipe determination are entirely practical; known mixtures are first given to the student to examine, and when he is sufficiently familiar with them, unknown mixtures are determined. In the second year the lectures are illustrated by conferences, where the student is required to determine minerals by their physical and blowpipe characters. The mineralogical cabinet contains about eight thousand specimens, which are labeled and open to the public. Besides this, there is a collection of about two thousand specimens, to which the students have an unrestricted access.

GEOLOGY.—The course of instruction in this department is as folows:

First year.—Botany and zoology as an introduction to paleontology; lectures throughout the year.

Second year.—Lithology: minerals which form rocks, and rock masses of the different classes; lectures and practical exercises. Geology: cosmical, physiographic, and historical; lectures throughout the year.

Third year.—Economic geology: theory of mineral veins, ores, deposits and distribution of iron, copper, lead, zinc, gold, silver, mercury, and other metals; graphite, coal, lignite, peat, asphalt, petroleum, salt, clay, limestone, cements, building and ornamental stones, &c. Paleontology: systematic review of recent and fossil forms of life; lectures throughout the year.

METALLURGY.—The metallurgical course includes lectures on the preparation of fuels, constructions of furnaces, the manufacture of metals, projects and estimates for the erection of metallurgical works. The lectures cover a period of two years, and discuss in detail the methods in use in the best establishments in this country and in Europe for the working of ores, with practical details of charges, labor, and cost of erection, obtained from the most authentic sources. Special attention is given to ores of this country which are difficult to treat, and to the solution of practical problems which are likely to occur. The lectures are illustrated by models, drawings of furnaces, and collections of metallurgical products. The projects assigned to the students familiarize them with the method of making plans and estimates for the erection of works. The ore to be worked and the various conditions which are required are given to the student at the close of the second year. During the summer vacation he is expected to visit works and to ascertain what the practical requirements are. During the third year the drawings, estimates, and descriptions of the processes are completed and submitted for inspection and approval.

MINING ENGINEERING.—Mining engineering is taught during the second year. The instruction comprises a course of lectures illustrating the theory and practice of mining operations at home and abroad; giving the general principles of reconnoitering and surveying mineral property and mines; the attack, development, and administration of mines, and the mechanical preparation of ores, with the exhibition and use of all necessary reconnoitering and surveying instruments, particularly the mining theodolite, and the exhibition of various models.

In surveying the student is taught to make surface surveys of the limited extent he needs, and subterranean surveys to direct and adjust his works; also, the solution of some problems of underground surveying by descriptive geometry, and many special examples of determining lines on the surface corresponding to given lines below, &c. Attack describes the miners' methods, the use of drills, picks, powder, nitro-glycerine, compressed air, &c.; the proper location and construction of tunnels, slopes, shafts, wells for sounding, artesian wells, salt and oil wells, preceded by a theory and description of the most typical veins, true or irregular, and other deposits of ore, salt, coal, and oil, exemplified at home and abroad.

Development includes the best methods for laying out subterranean works for production and conservation in the present and future; for proper and economic ventilation, transportation, hoisting, pumping or draining, distribution of workmen, &c.

Administration includes a review of the foregoing, with regard to a concentration of ideas and a general comparison of production cost to market price of untreated ore. Here the student is taught to forecast the expense of the establishments he must make, their annual cost, the cost of miners, employés, machines, material, &c., and offset these with the result of production, so endeavoring to solve the problem of making a given mine pay in given circumstances, by scientific attack, distribution, and general rational economy.

Mechanical preparation describes the various accepted methods of reducing massive ores to a condition either yielding metal or fitting the material for metallurgical processes. Models of stamps, crushers, shaking-tables, sluices, &c., are exhibited with plans and sections of mills and coal-breakers.

MACHINES.—The course on machines, which is inseparable from that of mining engineering, is given during the third year. It teaches the theory of the machines used in mining works. It is the application of mechanics to the construction of water-wheels, turbines, wind-mills, steam and hot-air engines, pumps and ventilators, transmission of force by compressed air, and the formulæ, with their theory, for the resistance of materials. Models of water-wheels, steam-cylinders, steam-engines, blowing machines, &c., are exhibited.

In the resistance of materials the calculations are shown for the sections of different parts of machines, the fly-wheel, pump-rods, connect-

ing-rods, &c., also for such constructions as retaining walls, arches, timbering, supports, &c. The course of the third year also includes a plan of drawing and estimates for some projected work of mining or the construction of a machine for some of the uses of mining.

This system of projects is to the young engineer a real practical application of all his three years' study, by which he is made to investigate prices, compare theories, models, methods, and dispositions, and, in competing with his class, to take pains to furnish the best arguments, illustrations, and calculations he can in order to support his views.

LIBRARY AND COLLECTIONS.—A special scientific library and reading-room have been provided for the use of the students of the school, which already numbers two thousand volumes, and which is rapidly increasing. Seventy of the best foreign and American scientific journals are regularly received. Collections of specimens and models illustrating all the subjects taught in the school are accessible to the student, including crystal models, minerals, ores, and metallurgical products, models of furnaces, collections illustrating applied chemistry, fossils, economic minerals, rocks, Olivier's models of descriptive geometry, models of mining machines, models of mining tools.

The lectures on crystallography are illustrated by a collection of one hundred and fifty models in glass, which show the axes of the crystals, and the relation of the derived to the primitive form. This suite is completed by three hundred and fifty models in wood, showing most of the actual and theoretical forms.

The collection of minerals comprises about eight thousand specimens, arranged in table cases. The minerals are accompanied by a large collection of models in wood, showing the crystalline form of each; arranged in wall cases are large specimens, showing the association of minerals.

A collection of metallurgical products, illustrating the different stages of the type process in use in the extraction of each metal, is accessible to the students. This collection is constantly increasing. Most of the specimens have been analyzed and assayed.

An extensive collection of models of furnaces has been imported from Europe. A very large number of working drawings of furnaces and machines used in the different processes are always accessible to the students; and several thousand specimens of materials and products illustrating applied chemistry have already been collected.

The geological collection consists of over sixty thousand specimens, including systematic series of rocks, fossils, and useful minerals. In this series is to be found the largest collection of fossil plants in the world, including many remarkably large and fine specimens, and over two hundred new species, of which representatives are not known to exist elsewhere. Also, the most extensive series of fossil fishes in the country, including, among many new and remarkable forms, the only specimens known of the gigantic dinichthys; a suite of Ward's casts of extinct saurians and mammals; a fine skeleton of the great Irish elk, &c.

REQUIREMENTS FOR ADMISSION.—Candidates for admission to the first year of the school must not be less than eighteen years of age. They must pass a satisfactory examination in algebra, geometry, and plane, analytical, and spherical trigonometry, physics, and general chemistry.

Candidates for the preparatory year must be seventeen years of age, and must pass a satisfactory examination in arithmetic, including the metric system of weights, measures, and moneys, and in portions of algebra and geometry. Those who are not candidates for a degree may pursue any of the branches taught in the school.

During the session the students visit, with one of the professors, the different machine-shops and metallurgical establishments of the city and its environs. During the vacation each student is expected to visit mines, metallurgical and chemical establishments, and to hand in, on his return, a journal of his travels, and a memoir on some subject assigned him. He is also required to bring collections, illustrating his journal and memoir, which collections are placed in the museum, reserved as a medium of exchange, or made use of in the laboratories. For pupils who have been proficient, and who desire to devote special attention to any one branch, application will be made for permission to work in particular mines or manufactories. This will be done only as the highest reward of merit that the institution can give. Prizes are awarded to students who pass the best examination in mineralogy, qualitative and quantitative analysis, and assaying, &c. At the close of the course are conferred degrees of engineer of mines, bachelor of philosophy, and doctor of philosophy.

The fee for the full course is $200 per annum.

Special students in chemistry pay $200 per annum. Special students in assaying are admitted for two months for a fee of $50 in advance. The fees for single courses of lectures vary from $10 to $30. Students unable to meet the expenses of the school are instructed gratuitously.

CONCLUSION.

As mining is such an important department of American industry, it may be presumed that, at least in all those States possessing large mineral deposits, the many colleges to be erected under the provisions of the congressional act of 1862 will make liberal provision for instruction in the science and art of both mining and metallurgy, and thus save our country from the further necessity and discredit of looking to foreign lands for the education of engineers competent to locate, open, and direct our mines, and construct and manage our metallurgic establishments.

It is encouraging to note that already the subject of the establishment of a central government school of mining has been discussed in Congress, and ably advocated by Senator Stewart, Commissioner J. Ross

Browne, and by Commissioner Raymond in his report for 1868. It has also been discussed by Professor Blake in the Report on the Precious Metals.

Before closing this notice of the mining schools of the country the establishment of a mining school in Mexico during the last century should be mentioned.

In Mexico a "Royal Seminary of Mines," and school for the instruction of those intended for mining, was established by an ordinance in 1783. The expenses of the erection, maintenance, and improvement of the seminary were defrayed out of the endowment fund of mining, and the direction was intrusted to the director-general of mining, together with the royal tribunal-general of mining.

The professors, before being appointed, were required to solve certain problems in the art and science of mining and to deliver a lecture of two hours' length on points which the director at the moment proposed, and in the presence of the royal tribunal and of the notary.

The master professors, besides teaching daily by theoretical and practical lessons, were required to present, once every six months, a memoir or dissertation on some subject useful and advantageous to mining. These memoirs were read to the royal tribunal and were preserved in its archives in order that they might be printed and published whenever it appeared expedient. The instruction was free, and at the outset provision was made for the support and clothing of twenty-five children, Spaniards or noble Indians of legitimate birth, preference being given to the relatives of miners, and especially to those whose ancestors had resided in the mining districts.

VI.—SCHOOLS OF ENGINEERING.

Under the head of schools of engineers it is proper to include all classes of schools in which it is the main object to teach the mathematical, physical, and natural sciences in their direct relations to the construction of important works. The first professional schools of engineering were general in character; but as the sciences developed and different departments of public enterprise became more extended, special schools were demanded, and we now have, taking the nations under survey, a great number of schools of mechanical engineering, schools of civil and topographical and hydrographical engineering, schools of bridges and highways, schools of marine engineering, and schools of military engineering.

In some cases they are found as separate and distinct institutions—which is the case oftener than otherwise with the military and hydrographic schools; in others, and more generally, in connection with and an essential part of the polytechnic schools. Among the schools of the scientific professions none are so universally found in all enlightened countries.

In France, England, Belgium, the German states, Russia, Austria, Italy, Spain, and Switzerland they have already been thoroughly estab-

lished, in the appreciation of governments and people, as of first importance; while in the United States and in several of the South American states they are now engaging the public attention and receiving a rapid development. In the subsequent treatment of polytechnic schools I shall illustrate the scope and character of the teaching in the engineering departments of those great institutions, and, in this connection, will limit myself to such brief account as will serve to convey an idea of the condition and progress of this profession in the countries either most noted for their engineering achievements or for their recent endeavors to make progress in this direction.

FRANCE.

In France, whose position is foremost among the nations in this department—her highways, railroads, canals, harbors, and fortifications being models worthy the imitation of the other powers, and her engineers being found to-day at the head of the most important public works in every part of the world—the profession is more especially taught than in any other country, and with a degree of thoroughness hardly equaled in the civil and hydrographic departments.

The foundation of engineering as a science is first firmly and thoroughly laid at the Imperial Polytechnic School, in which he instruction in the mathematical and physical sciences is unsurpassed; and no young man of the empire can hope to enter any important branch of the public service by any other door. Pretension is of no avail. The ordeal of successive examinations by the ablest and most relentless scientific men of the country stands resolutely in the way of undesirable candidates. When at last ready for admission to the study of the chosen branch of the service, they who would enter the civil department as directors of imperial operations on the land—such as the building of bridges, canals, railways, and the public highways of the empire—are received at the School of Bridges and Highways, (*École Impériale des Ponts et Chaussées,*) at Paris, an institution under the control of the minister of agriculture, commerce, and public works. Such as wish to become hydrographic engineers or marine engineers attend the *Écoles d'Hydrographie* and the *École Impériale Navale*, which are under the control of the minister of the marine. Those who design to enter the profession of mining engineering are received into the *École Impériale des Mines;* and such as propose to enter the military service in the engineering department are further prepared at the military schools.

At the *École Impériale des Ponts et Chaussées* pupils not candidates for admission into the service of the state as members of the corps of engineers are also admitted, if between the ages of eighteen and twenty-five years and competent to pass the requisite examinations. These consist, first, of written compositions, one or more, on subjects named in the prescribed programme; secondly, the execution of a design in descriptive geometry and flat-wash architectural drawing. If the candidate is then

approved he is admitted to the oral examinations in arithmetic, algebra, geometry, plane trigonometry, analytical and descriptive geometry, differential and integral calculus, mechanics, physics, chemistry, and architecture. Having successfully passed these several examinations, he is admitted to a three years' course of study, embracing all the sciences in their higher range and in their special applications. The school year begins with the 1st of November and ends with the 30th of April, the vacation being spent in connection with the public works in progress of execution in various portions of the country. Instruction in this school is gratuitous.

SPAIN.

Spain presents the anomaly of being among the most backward of all the countries of Europe, as before remarked, in matters of general education, and yet among the foremost in this particular department under consideration. At an early date—quite before the establishment of schools of engineering in several of the more enlightened and more powerful nations—the aspirations of the Spanish government for high rank in the matter of public works led to the establishment at Madrid of a special school of bridges and highways. It was not until 1834, however, that it came to have a settled and undisturbed existence. Since that date it has sent forth not a few engineers of high merit, whose accomplishments in the construction of public works have contributed much to the reputation at present enjoyed by the Spanish corps of engineers.

This school is under the superintendency of a superior commission, composed of an inspector general (of the corps of engineers, bridges, and highways) of the first class as president, the director of the school, two inspectors general of the second class, and one professor of the school as secretary.

Applicants for admission as regular pupils must present the diploma of bachelor and undergo an examination in four distinct series, bearing upon the following subjects, to wit: arithmetic; algebra, embracing the theory of equations; geometry; plane and spherical trigonometry and the use of logarithms; analytical geometry of two and three dimensions, comprehending curves and surfaces of the second degree; design; and correct translations of the French and English languages.

The full course of instruction is divided into six annual courses, and is so complete and thorough that I deem it proper to present it in full, as follows:

First year. Infinitesimal calculus, comprehending differential and integral calculus, the elements of elliptic transcendents, the calculation of finite differences and of equations; descriptive geometry, embracing its applications to perspective and the determination of shadows, as well as graphic problems relating to all portions of this branch of the science; physics, in its special relations to the science of engineering; topographical, design, and landscape drawing.

Second year. Rational mechanics, embracing statics, dynamics, and the elements of hydraulics; geodesy, including topography, terrestrial and celestial geomorphy, gnomonics, the tracing of charts and plans, with all the necessary graphic exercises; chemistry, as applied to the analysis of waters and materials used in constructions, with practice in the laboratory; topographical, design, and landscape drawing.

Third year. Mechanics, applied to constructions, comprehending the resistance of materials, the theory of walls and arches, of stone bridges, iron bridges, and suspension bridges, the application of the principles of hydraulics to shock, the resistance and flowing of fluids—all with graphic exercises and practice; stereotomy, applied to stone, wood, and metals, with the solution of graphic problems and the construction of models in plaster; geology and mineralogy in their applications to the exploration of lands and the exploitation of materials; construction, (part first,) including a study of the preparation of materials, the execution of all kinds of masonry, and the construction of carpenter's work in wood or in iron, with graphic exercises and the execution of projects.

Fourth year. Construction, (part second,) including foundations, auxiliary works, embankments, tunnels, bridges, and viaducts of all classes, with the formation of plans and other practical exercises; the application of hydraulics, embracing irrigation, drainage, and the distribution of water; machines—their theory, their construction, and the study of meters and generators in ordinary use in public works—with graphic exercises and excursions to visit important workshops and factories.

Fifth year. Navigable rivers and canals, including the study of inundations, and various graphic and practical works relating to this subject; ordinary highways, with the formation of plans of routes and the construction of roads; architecture, embracing the distribution and decoration of edifices, the history of art, (especially Spanish art,) together with graphic exercises looking to the formation of architectural plans; excursions to the most important public works, Spanish and foreign.

Sixth year. Railroads, their construction and exploitation; the study of railway carriages and other vehicles of every kind, as well as of electro-telegraphy; ports and maritime works, embracing the study of ports, light-houses, and the buoyage and lighting of coasts; political economy and administrative rights, with the special study of those sciences which have more remote application to public works.

The full corps of professors numbers eighteen, besides the director.

As auxiliaries to the courses of instruction given by the faculty, there are connected with this school a valuable scientific library of 11,000 volumes; a museum of models of machines, apparatus, and diverse constructions; a collection of the woods of Spain, with all sorts of tools and implements used in various exploitations; a cabinet of physical apparatus; geological and mineralogical collections; collections of hydraulic, mechanic, and geodetic instruments; and powerful machines for testing the resistance of materials.

After this partial introduction to the central source of engineering science in Spain, we are better prepared to understand how it is that some of the most remarkable mountain railways and other works have been built by Spanish engineers.

ITALY.

Italy is also found in the same category with Spain, as doing less for the education of the people in general, as well as for education in the scientific professions, than the other leading and many of the lesser neighboring powers, and yet as taking the engineer under special protection. In like manner, her more recent public works are of a character to applaud and sanction the wisdom of this fostering care, as every one must testify who has passed over that remarkable mountain railway between Pistoja and Ferrara.

The royal schools of application for engineers, (*scuole d'applicazione pergli ingegneri*,) located at Turin, Milan, Naples, and Ferrara, are all of superior rank, providing excellent courses of instruction, with corps of twenty to thirty professors and teachers, and being furnished with laboratories, libraries, and means of illustration. Engineering is also quite generally taught, and to more than the usual extent for schools of that character, in the *scuole techniche*, of which notice has already been made in another place.

AUSTRIA AND OTHER GERMANIC COUNTRIES.

In Austria and the other Germanic states, as also in Switzerland and Belgium, polytechnic schools of high rank, and all including schools of engineering, so abound that there is but little need of separate ones.

DENMARK, NORWAY, RUSSIA.

In Denmark provision is made for engineering in the Polytechnic School at Copenhagen, of which some notice will be made in another place.

Norway has a school for instruction in mechanics and engineering connected with the naval workshops at Carljohausvœrn, which is open alike to youths and adults. The course of study embraces elementary and higher mathematics, mechanics, physics, &c. The teachers are nominated by the navy department and supported by the state. Tuition is free. This school as yet occupies but a limited field, but is well attended, and is about being enlarged both in accommodations and in the number of its students. Engineers in the service of the royal navy must attend the school before advancing into the higher grades.

Russian schools of engineering are invariably connected with the polytechnic institutions.

NORTH AND SOUTH AMERICA.

In the Western World, the grandest theater for engineering operations on the globe, professional instruction is at present confined to rather

brief courses in the two or three polytechnic schools, and perhaps an equal number of incipient departments in the new colleges of agriculture and the mechanic arts of the United States, and to the central college of Brazil at Rio Janeiro, which last, however, is a noble institution, with a six years' course quite equal to that of Spain, and is relatively more worthy than any we have of the empire in whose interest it was established.

I trust that with the rapid development of our numerous colleges of the mechanic arts now being planted in all the northern and in some of the southern States we shall soon be able to give to our young men of mathematical and mechanical genius a professional training in this department of applied science that shall be inferior to that of no other country in the world.

VII.—SCHOOLS OF ARCHITECTURE.

The subject of architecture and of schools of architecture, as connected with the Exposition of 1867, possessed unusual interest, by reason of the remarkable illustration it had in the multitude of the models, plans, and designs presented of structures of every class within the domain of that art, as well as in the economical construction of the Palace itself, and in the large number of varied and interesting representatives of the architecture of different nations in the Exposition Park.

Schools of architecture, distinctively considered, are a growth of the present century, though as an occupation, and to some extent as an education, it has had a development coeval with that of agriculture, which together constituted the primal arts of the race. It is due to the people of the times preceding these institutions, and to the architectural works they have left behind them, to say that it had reached in their hands a culmination never since equaled by the teachings of modern schools in the two great essentials of the art, durability and symmetry.

Schools of architecture are now found in most of the civilized countries of the world, Germany alone furnishing them to a total of not much less than forty, scattered through its principal towns and cities. Here, as in France, Austria, Italy, Switzerland, Russia, the Scandinavian states—Norway, I believe, excepted—and even in Brazil, architecture has the dignity of a profession taught in special schools, or in the associated schools of polytechnic institutions.

In illustration of the wide range given by science to the education of the architect, a brief summary of the subjects in which instruction is given in the Royal Architectural Academy of Berlin will here be made: physics; chemistry; mineralogy; the nature of materials; descriptive geometry; perspective; analytical geometry; statics; hydrostatics; mechanics; hydraulics; ærodynamics; machinery; laws of constructing all parts of edifices and machines; the monuments of antiquity; the comparative history of architecture; architectural machine-drawing, in its full extent; the construction of roads, railroads, and canals; rural

and city ornamental architecture; plans, calculations, and estimates for every variety of building; geodesy; and the general management of architectural business.

This course of instruction, by more than a score of professors and numerous assistants, covers from five to seven years, according to the ascertained proficiency of the student, whose admission to the academy involves a stipulated amount of both general and special scholarship, such as may be secured at the gymnasium and real-school.

The certificates from this institution are of two grades—that of builder, after a two years' selected course and one year of practice; and that of architect, after three years' study and two of practice. A failure at examination for either of these may be supplemented by an additional year of study before being finally furnished with or dismissed without the honors of the institution.

The Central School of Architecture at Paris receives pupils thus accredited: those from home departments must bring a certificate of general acquirements in the usual branches of school study; and of some special training in drawing and designing, and of aptitude for the profession they aspire to enter—the first from a well-known local professor and the second from an architect, both named by the director of the Paris school; and those from abroad, the same from an accredited architect and a professor of some university. Applicants must also present to the committee of examination samples of their own work, to the extent of a model in ornamental bas-relief, a design in crayon giving both the ground plan and the elevation of a building, and a description of it in writing. To this is added oral examinations in arithmetic, algebra, geometry, trigonometry and descriptive geometry, and geography. Having established so much, the candidate next furnishes illustrations of his work in relation to questions on descriptive geometry, and, if he has made any progress in the previous study of it, samples of his drawings and essays on architecture. Passing these tests with credit, the candidate is admitted to the gratuitous instruction of the school; and failing, he pays the expense of his examination and goes his way.

The course of study is arranged for three years before the student is admitted to an examination, which, if satisfactory, brings a certificate of honorable dismissal. In case of a failure at this time, and there is no lack of natural aptitude discovered, the pupil may pursue one more year of study, either here or with private tuition, before he is permitted one more, and this time a final, test of proficiency.

For fuller details of courses of study in schools of this class, see a subsequent notice of those connected with polytechnic establishments.

VIII.—SCHOOLS OF NAVIGATION.

When special schools for instruction in navigation had their origin, it is difficult to say; though it is evident that the date of scientific schools of this kind does not lie behind the invention of the compass and the

astronomical instruments essential to a bold and free exploration of the seas; since, before that period, when the sailor crept along the shores of narrowly-inclosed waters, and was chiefly in need of a practical knowledge of the craft in which his voyage was made, navigation was only a rude art. But when, in the fourteenth and fifteenth centuries, came those inventions and discoveries which gave the navigator true ideas of the form of the earth, and put him in familiar relations with the heavens, so that he was henceforth at home wherever the face of the sun might be seen, and could fearlessly turn the prow of his ship into unknown oceans, navigation became a science, and in some form was taught in the schools.

In that country that gave to the world not only the compass and the telescope, but also a Columbus and Vespucius, and whose navigators and sailors are still among the best in the world, instruction in the principles of navigation is mainly given in the university faculties of physical, mathematical, and natural science. In Spain, entitled to share with Italy the honor of opening the way to the New World, and which, for a time, led all the nations in its command of the waters of the globe, it is also taught in like manner. But in Russia, whose scope for navigation is more in the future than in the present; in Prussia, whose freer way to the sea has only been lately fought for and secured; in heroic Netherlands, once mistress of the seas, and whose present more domestic daily life is a literal voyage; in old Scandinavia, from whose rugged shores, almost a thousand years before science came, went forth those grim and daring Anglo-Danish, and Northmen adventurers into the Northern Ocean, and even cruised in the Mediterranean Sea; in Great Britain, whose navies proudly ride in the waters of every sea on the globe; in France, great but not foremost in her merchant and military marine—in all these countries there are, and have been for many years, special schools for the instruction of youth and men in the science and art of navigation.

We, also, of the Western World, are navigators of the seas, and our ships are at home in all waters. But unless I am strangely in error, in the matter of provision for that instruction of our navigators and seamen which the commerce of our country demands, and will every year more and more demand, we may with profit turn to the example of some of the other powers, whose movements of late indicate a higher appreciation of their interest and duty in this regard.

Perhaps, also, the recent attention given by European governments to this matter is partly due to the fact that the changes wrought in the art of navigation by the introduction of steam, as a propelling power for ships, have necessitated a reorganization of the old schools no longer fully equal to their work. Be this as it may, it is a notable fact, and one brought to the attention of civilized nations by representations made at the Exposition, that the schools of navigation of even France and England—countries long foremost in this department of special

education—have been hitherto neither as numerous nor as good as the nature of the service and the extent of their maritime interests demand, and that they are therefore earnestly at work in multiplying and improving them.

FRANCE.

In France the schools of navigation are of various grades and character; some of them being for mere children, whose fathers follow the seas and desire themselves to be followed by their offspring; some for youths, above the minimum of thirteen years of age; some for more advanced and somewhat experienced seamen under the maximum age of twenty-three, whose destiny is to take command either of vessels designed for foreign trade or for coasting along the shores in domestic trade. Of whatsoever class, they are free, and under the control of the minister of marine and of the colonies.

The aim of the government is the establishment of a great number of nurseries, from which, by a carefully-devised system of promotions, the filling of vacancies or the supplying newly-created places in the commercial navy may always be by transfer from a school whose thorough teaching is a guarantee of fitness for the service.

As early as 1791 the National Assembly decreed the existence of gratuitous instruction in navigation in thirty-four of the maritime cities. Afterward, the schools were increased to forty-two, the present number. The instruction in these several schools is given by at least one competent navigator, and is divided into two courses—one elementary and essentially practical for the formation of masters of coasting vessels, the other superior, and both practical and theoretical, designed for the qualification of candidates for the captaincy of vessels employed in foreign commerce.

Pupils may be admitted at thirteen years of age, though the attendance is usually by young men of over twenty, who, after completing their primary instruction in navigation at the lower schools, and spending some years in the marine service, desire to add the studies requisite to their admission to the rank and position of master or captain.

The elementary course embraces the following studies: practical arithmetic; geometry; practical navigation; elementary principles of the construction of steam-engines; nautical calculations.

The superior course includes: arithmetic; algebra and geometry; plane and spherical trigonometry; elementary principles of astronomy; practical navigation; the use of nautical instruments and nautical tables; practice in making calculations; study of the steam-engine in its applications to navigation; the French language.

The examinations are held annually by persons detailed by the government for that purpose, but no one can be admitted to a trial of his qualifications who has not attained the age of twenty-four, and who has not served on board a French vessel of some description for the term of five years.

The practical examinations are conducted by experienced captains of vessels, and embrace the rigging of ships; maneuvering of sail-vessels and steamships; knowledge of coasts, currents, tides, and gunnery.

If successful in passing this ordeal, the candidate receives a certificate of aptitude, and may then present himself for examination on the theoretical courses taught in the school.

These schools of navigation (*Écoles d'hydrographie*, as they are somewhat inappropriately called) were attended in 1867 by a total of 1,500 pupils—the number graduated being, of masters, 301; of captains, 219.

Of the schools of lower rank, including schools of apprenticeship, ship-schools, &c., I do not deem it necessary to speak except to say that, with the reorganizations and changes lately effected, and the increased attention to instruction in the construction and management of steam-engines, &c., they promise greater usefulness than heretofore.

ENGLAND.

In England the reorganization of schools of navigation began in 1853 by the transfer of their supervision from the mercantile marine department of the Board of Trade to the newly-created department of science and art. Instruction in navigation had long been given by private teachers in the seaport towns to a comparatively small number of those whose responsible duties demanded the most thorough preparation. Realizing the necessity for the improvement of this condition of things, the marine department of the Board of Trade had already created two schools, one at London and one at Liverpool, making an arrangement with the admiralty to permit the special fitting of graduates from the Royal Naval School for the position of masters in these schools and in others that might be established. Subsequently, under the administration of the department of science and arts, seconded by boards of trade in the cities, the number of those established by joint efforts of government and municipal boards was increased to eighteen; their location being in all the most important seaport towns.

The age at which pupils may be admitted varies considerably, though not designed to fall below twelve years. The minimum age at which boys are received upon merchant ships being fifteen, it is deemed important to enlist them as pupils in the navigation schools before they become inclined to some other profession. Competent teachers, subject to visitation and supervision from the appointees of the department, are employed by it at a fixed amount; the remainder being made up by aid from the municipal boards and by fees from the pupils. The amount paid by government is determined by the character of the certificate held by the master; the amount paid for superior proficiency in certain groups of subjects being greater than that paid for proficiency in certain other groups. For example: proficiency in mathematics, chemistry, natural history, drawing, and the adjustment and skillful handling of instruments, entitles the master to £5 for each of those branches; while

success in physical geography, in physics, mechanics, marine steam-engine, to £10; and in general navigation and nautical astronomy, to £15.

The fees paid by pupils differ somewhat for the different schools, and, in any given school, vary with the grade and studies of the pupil. In the London school, boys intending to be seamen, but not navigators, pay 6*d.* per week; boys studying navigation, 1*s.*; seamen not studying navigation, 1*s.*; apprentices on ships not studying navigation, 1*s.*; apprentices studying navigation, and all others above their grade, 6*s.*

Every school is divided into an upper and a lower section, each with at least one master.

The lower section is principally composed of apprentices and seamen who are employed during the day at their ships in the docks, and who have acquired the rudiments of an English education before entering the service. However short their stay in port, they are encouraged to attend the school, between six and nine o'clock in the evening, to acquire a knowledge of the principles of ship-sailing, the use of nautical instruments, &c. Instruction is also given during the day to regular pupils.

The course of instruction in this section comprises: reading and writing; correspondence; arithmetic; geography; the sailings; use of the sextant; and method of keeping ship's books.

The upper section is for the instruction of masters and mates in the science of navigation. The course of instruction in the best of the schools includes: algebra to quadratics with application; geometry, (I, II, III, Euclid;) plane and spherical trigonometry; navigation; nautical astronomy; practical use of the instruments used at sea; physical and descriptive geography; chart-drawing and free-hand drawing; surveying; history, especially Scripture and English history; letter-writing and book-keeping; mechanics and steam-engine; magnetism and electricity as related to ships; laws of storms and tides; study of the code of signals; mercantile laws and usages, (so far as demanded by the masters of ships;) gymnastics.

The government provides the several schools with the necessary instruments, and disburses aid according to a plan carefully prepared.

The number of pupils of every class attending these schools at present is between three and four thousand.

In my visits to various schools not alone in England and France, but also in other countries less maritime than they, I have been deeply impressed with the office they are fulfilling, not only in the way of insuring to commerce a larger proportion of skilled and trustworthy mariners for the growing commerce of the nations; but, also, with the moral influence they are calculated to exert upon a large class of persons always heretofore neglected as being incorrigibly depraved—I mean sailors generally—who, though not one in a thousand may actually attend the schools, will nevertheless derive indirect advantage from association with, or subordination to, the few who do attend them.

Why may we not establish one such school of navigation in each of our large commercial towns, giving thorough and free instruction to such of our actual and prospective navigators and seamen as by means of valuable day teaching and evening lectures may be induced to attend?

Surrounded, almost, by great oceans, gulfs, and inland seas; with greater total length of navigable rivers than all the countries of Western Europe put together; and having a foreign commerce whose aggregate value already equals $852,072,156; a domestic, lake and river commerce vastly superior to that of any nation in the world, and a future only limited by the wisdom with which we provide for it, we can hardly be too prompt, or too liberal and thorough, in making such provision in this department of education as shall insure to the country, in every branch of the commercial service, a class of navigators fully worthy of their important duties.

CHAPTER VIII.

COMMERCIAL, NAVAL, AND MILITARY SCHOOLS.

I. Commercial schools of the United States and Europe—II. Naval and military schools of the United States, England, France, and other countries.

I.—SCHOOLS OF COMMERCE.

UNITED STATES.

If schools of agriculture and the mechanic arts are essential to the advancement of those productive industries, it is no less demonstrable that schools are also important to commerce, which, by reason of its power to awaken and stimulate enterprise, multiply inventions, cheapen production, and establish relations of amity and intercourse among communities and nations, is thus really and directly a great civilizer of mankind.

At the late Exposition several of the great powers were represented by exhibits from their commercial schools—all of comparatively recent origin, and among the many hopeful signs of the times.

If, as is claimed by statisticians, a very small percentage of all who engage in commerce make it a permanently successful business—the vast majority either voluntarily escaping from it, or being drawn into the maelstrom of bankruptcy—is it because failure is absolutely unavoidable, or rather because it is an exceedingly difficult science, demanding, in addition to that ordinary discipline, culture, and information which every man ought to possess, a thorough acquaintance with countries, populations, and histories; familiarity with the conditions and processes of production; the nature and quality of materials and manufactures; knowledge of commercial law and international usage; and, more than all, a mastery of economical science in all its branches, and ability to cope with profound problems in social philosophy? Men of ordinary intellectual endowment, if thus qualified for commerce, would rarely fail except by reason of unavoidable disaster. That so large a proportion of those who engage in it do fail, is because so large a majority are totally ignorant of the first principles of the business.

I am aware that the attention of the American public has been more or less drawn to this subject during the past twenty years, and that within that period there have sprung up many schools intended to supply this great lack of the means of professional education. And yet it is a fact that cannot be disguised, that, while they do undoubtedly accomplish much good in the way of adding somewhat to the qualifications of hundreds of our young men who would otherwise enter into mercantile pursuits without any special qualifications whatever, very

many of the hundred and fifty "commercial colleges," whose names are emblazoned on the fronts of magnificent buildings in an equal number of our great cities, to say the very least, wear larger titles than the amount and quality of instruction they give fairly warrant.

One of the most remarkable of the commercial-school enterprises of this country is the organization, by several enterprising individuals associated as an unincorporated firm, of what is styled the "Chain of international commercial colleges." This chain comprises in all forty-two schools, forty of which are located in the chief cities of the Union, from Portland to New Orleans, and the other two in Canada, at Montreal and Toronto. Being under the general direction of the proprietary company, they are severally managed in detail by local superintendents. By virtue of this association of schools under one head, the regulation is such that a student, after completing the course of studies in one, may again take them up and pursue them at another school of the chain without additional expense.

These several schools advertise to give thorough instruction in book-keeping, including merchandising, jobbing, banking, &c.; commercial law, commercial arithmetic, penmanship, and business correspondence, and some of them also furnish occasional lectures on economical science. But the course of study necessary to a diploma (and in this respect I believe there is no difference between the chain and the other private and incorporated colleges of the country) embraces but four and a half months; which, in view of the fact that nothing more in the way of preparation for admission is required than a fair knowledge of the ordinary English branches, is certainly a very brief period for the study of so important and difficult a profession.

In none of our public schools are the foundation principles of commerce taught; and, so far as I am aware, none of our scientific and polytechnic schools provide so much as a brief or partial course preparatory to this profession. And yet, by geographical position and by the tastes of our people, we seem destined to a commercial career such as no nation of the world has ever had.

But the history of foreign countries in this particular gives warrant for the hope that this department of professional instruction will not always be neglected by us as now, since it is only lately that even the most forward of them have taken decisive steps in this direction.

FRANCE.

France has the honor of taking the initiative, and that at a period in the history of the country when the old prejudices against trade had just been strengthened by many years of war, and the whole people had been filled with ideas of the glory which comes of achievements in arms, to the exclusion, almost, of all just estimates of the honor as well as necessity of industry as the only sure basis of national prosperity and greatness; at a period, in truth, when commerce was despised and

hence almost abandoned to the more ignorant and unskillful men of the country.

The first special school of commerce was founded in 1819, at Paris, under the patronage and direction of the commercial firm of Messrs. James Lafitte & Co., generously seconded by a few other intelligent merchants of the capital, zealous for the advancement and elevation of their favorite pursuit. After encountering much opposition and discouragement from the great majority, who believed the counting-room the only proper school of preparation for business, and meeting still greater embarrassment from not being able either to determine just the combination that should be made of general and special studies in the programme of instruction, or to find competent and willing professors, these gentlemen at last conceived the happy idea of calling together a number of the most intelligent and liberal of the merchants, bankers, and industrial men, with some members of the Institute of France, for the purpose of determining, by comparison of views and a full discussion of the whole subject, what should be deemed the proper course of instruction as well as the best form of organization. As a result of these conferences an organization was formed under the title of council of improvement; an organization whose labors have been of the greatest value to the commerce of France, and which, being composed of some thirty of the foremost men of the country, whether in the department of science, of commerce, or of statesmanship, still continues its useful labors.

Thus fairly established in the public confidence by the high character of the men who engaged in the movement, this enterprise commanded the sympathy and concurrence of numbers of the principal merchants and bankers of the capital, who at first discouraged it; and at an early day the institution opened with nine competent professors, charged with giving instruction in the various departments of what was intended to be made the science and art of commerce. The school was intended for both boarding and day pupils. The term of study was fixed at two years; the minimum age of pupils at fifteen years. No one could be received at all for a less period than one year.

The instruction was given in three sections; each section or division being presided over by a special chief, under the supervision of a censor of studies. The first two divisions represented two distinct grades in the department of the elementary science of commerce, and had for their object the suitable preparation of pupils for the third; the line between the several divisions being so marked that no pupil could pass from one into the other without undergoing three several examinations, the first by the chief of his division, the second by the censor of studies, and the third by the director at the head of the school.

The third division was devoted to practice; each young man having a separate bureau, in which were his account-books, treasury, &c., and receiving a capital fund consisting of fictitious bank-bills engraved for the

use of the school, moneys of all kinds and values for change, and letters of exchange upon various commercial places in Europe. Each young merchant thus established represented some business house either in France or in foreign countries, and among themselves were carried on all forms of commercial business, as though the school had been the real world. To familiarize them with the different qualities of articles found in commerce, a museum was established in connection with the school, in which the pupils, as incipient traders, were made acquainted with the appearance and properties of both the honestly-produced or manufactured articles and the fraudulent counterfeits of them.

To this practical instruction was added the study of the living languages, especially French, English, German, and Spanish, each taught by professors to whom the particular language was native, and to whom also the whole vocabulary of commercial affairs was entirely familiar; courses in commercial law, political economy, statistics, geography, the history of commerce, &c. At the end of each year there were public examinations, at which the leading merchants, bankers, scientific professors, political economists, and the public generally attended, often to the number of one to two thousand persons.

The revolution of 1830 was the occasion of the school being closed for a time; but it was at length again opened in 1838, under the auspices of the minister of commerce, who had been struck with the great services it had rendered to the country, and who accorded a considerable number of pupil-bursaries and demi-bursaries as a means of enabling poor but meritorious young men to avail themselves of its benefits. Subsequently, in 1853, it was decreed that these bursaries should be accorded only to such as merited them by personal qualities and preparatory knowledge manifested at public competitive examinations held in the principal commercial cities; and that they should be renewed annually by thirds. This measure seems to have produced important results: first, stimulating ambition for excellence in the way of thorough preparation; and, secondly, by giving to the school a sort of national character, and keeping the importance of a study of the science of commerce before the youths of the empire who looked to it as their future pursuit.

Within the past few years some modifications have been made, however, and the bursaries, no longer deemed necessary, have been discontinued. There has also been a discontinuance of the use of the bank-bills and fictitious moneys at first used, and some changes in the organization and régimé of the school, as well as in the distribution of rewards, &c. At present only boarding pupils are admitted, and the number of these is limited to 100. There are four dormitories, with private chambers, in which the pupils merely sleep, their entire active life being spent in common in the counting-rooms, in the amphitheaters, and in their recreations.

The prizes are awarded at the end of an annual examination, con-

ducted by a jury consisting of the council of improvement of the school and the professors. To such as acquit themselves well in the first and second divisions, there are awarded two silver and four bronze medals, provided by the minister of agriculture, of commerce, and of public works; while those who rank first and second in merit in the third division receive from his Imperial Highness Prince Napoleon a medal of gold and a medal of silver as the first and second *prix d'honneur*. No certificates of proficiency in particular studies are given, and all diplomas must be signed by the minister who has the school under his special patronage.

Since the origin of this institution more than 5,000 pupils have passed from its halls into the various branches of the profession; while not a few of the graduates have attained to high positions in the consular and administrative services of the state.

Of the many schools of primary and secondary grade, as well as of those of superior rank in the other cities of France, the length of the foregoing account precludes more than a very general mention; although the history of the two municipal schools of Paris, in whose four-years courses of study excellent and quite complete instruction in commerce is furnished, and whose *diplôme spécial* is given by the Chamber of Commerce to such pupils as at the end of the fourth year give evidence of solid attainments, is hardly less interesting than that of the *École Special de Commerce* above given. I cannot, however, omit to notice the profound and intelligent interest manifested in this branch of professional education by the present distinguished and zealous minister of public instruction, who, in the law draughted by him and unanimously approved by the *Corps Legislatif* and the senate in 1865, for the incorporation, with the regular course given in the *lycées*, of a course of special instruction, carefully provided for the interests of commerce as well as for those of agriculture and the mechanic arts.

In France, commerce is henceforth a profession.

GERMANY, PRUSSIA, AUSTRIA.

Some of the German states, with that carefulness which pre-eminently characterizes the Germanic race, years ago made provision for special instruction in commerce in several of their schools of arts and trades, as well as here and there in a polytechnic school of higher rank. At Berlin, at Leipsic, at Nüremberg, at Dresden, and at many other points, commercial schools, both separate and associated with others, have thus existed for some time. But the most distinguished Germanic schools of commerce are those of Austria, located at Prague, Trieste, and Vienna; those at the latter place being not only the most noted, but also especially entitled to mention here as having been represented at the Exposition.

At about the same date with the commencement of the Parisian school, there was established a school of commerce in connection with

the *königlichen polytechnischen Institutes* at Vienna. This department still forms a part of the institute, and will be noticed under the polytechnic head.

But the most important school of commerce in Austria is the Commercial Academy of Vienna, *(Wiener Handelsacademie,)* founded in 1857, an institution of which also I am enabled to speak from personal acquaintance. The fund of $168,000 with which it was established was raised by subscription; and still other sums have been since added in aid of the enterprise until now, in a new and beautiful part of the city, and provided with technological collections of much value, a museum of raw materials and manufactured articles found in commerce, and with a finely-equipped chemical laboratory for the analysis of commodities, it stands a magnificent monument of the intelligence, enterprise, and liberality of the imperial city.

The academy is under the control of a board of management, *(Verwaltungsrath,)* consisting of a president, vice-president, and seven other members. The principal is known as director. The faculty consists of twenty full professors and three instructors in stenography and drawing.

The course of study is given in two divisions of two-years' duration each, four years in all; the first being preparatory to the second division, which is more strictly professional.

To be admitted into the first yearly course of the preparatory division, the applicant must be at least fourteen years of age, and have completed the course of study given in the lower gymnasia of Austria. For admission to the second year's course of the preparatory division he must be fifteen years of age, with corresponding qualifications; for admission to the first year's course of the second division, the age of seventeen years is requisite; and to the last year's course, eighteen years of age, with a certificate of honorable discharge from the higher gymnasium, and the ability to pass an examination in all the branches taught in the first three years of the academic course.

The instruction in the first division embraces general and political arithmetic, physical geography, history of Austria and of the world, zoology, mineralogy, botany and physiology, calligraphy, preparation for book-keeping; German, French, and Italian languages. Having advanced thus far, the pupil is enabled to make an intelligent beginning of book-keeping of a more complex and difficult character; and, accordingly, with the advantage thus gained by a knowledge of the terms used in science and commerce, with some knowledge of values and a partial acquaintance with the languages in which much of his correspondence will require to be conducted, he enters upon study and commercial practice in the office, at the school, with fair opportunity to make the most of its facilities, as well as to understand the more difficult branches of commercial calculation, the relations of geography and statistics to commerce, commercial rights, exchange, the relations between the product-

ive industry of his country and its commerce, the principles of political economy, &c.; all of which, together with a continuation of the study of natural history, of the materiel of commerce, and its technology, and the addition of the English language, are to occupy him for the subsequent two years.

The price of tuition at the academy is about sixty dollars per annum, with a laboratory fee of two dollars extra. The number of pupils in attendance has steadily increased from 50, with which a commencement was made, until it has reached the figure of 500.

Besides the regular courses of instruction, an account of which has been given above, there has also been opened an evening course for such as cannot attend during the day. This continues from October 1 to Palm Sunday, the instruction being given by lectures and otherwise each evening in the week, Sundays excepted, from seven o'clock to nine o'clock. At the end of this course, to such as have been regular in attendance and have made good proficiency, certificates are given stating the facts. The evening course during the last year was attended by between 250 and 300 pupils, a majority of whom obtained the certificate.

Prussia presents, in addition to many commercial schools of the ordinary kind, a very interesting example of a novel class of schools in the case of the commercial and industrial school for young women, at Berlin. This school was opened in 1866, under the patronage of the association for the promotion among women of the capacity for gaining a livelihood, and was designed more especially for young ladies of the higher and middle classes ambitious of self-support. The institution presupposes a good degree of preliminary culture, and hence provides a quite extensive course of study almost exclusively professional.

There are, in fact, two courses provided—one of two years for such as desire as thorough culture as practicable for some pursuit strictly commercial, and the other of one year for those who desire a general knowledge of such business matters, especially including the management of a household, as ordinarily belong to the sphere of women.

Young ladies of properly certificated character and qualifications are admitted on paying a matriculation fee of three thalers, (of 75 cents each,) and the established rates of tuition, which, for the full professional course, are 50 thalers per annum, and for the short course, 60 thalers. Ladies who board in the institution pay from 200 to 250 thalers per annum, in addition to the fees for tuition.

The institution is also open to ladies who may wish to attend individual courses of study, or be present at certain lectures. Persons of this class pay one and one-half to two thalers per half year for each subject thus studied.

The regular courses are open to no student for a less period than one year.

The general subjects embraced in the courses of instruction are:

1. General study of commerce and industry, including definition of

commerce; different kinds of trade; auxiliary means of trade; coinage, weights, measures, money, banking, and exchange; the most important laws relative to commerce and industry.

2. Commercial and industrial book-keeping, (by single and double entry.)

3. Commercial correspondence in German.

4. Commercial penmanship.

5. General arithmetic, with calculations relative to commercial and industrial enterprises.

6. Elements of natural history, as auxiliary to commerce and domestic economy.

7. Elements of physics and chemistry, as related to commerce and domestic economy.

8. Physiology, more particularly in its relations to culinary affairs.

9. Knowledge of goods and technology.

10. Synoptical view of commercial geography and commercial history.

11. Studies connected with the usual vocations of women, especially the study of domestic economy.

12. German language and composition.

13. French language and correspondence.

14. English language and correspondence.

15. Drawing, more especially free-hand and pattern drawing.

16. Stenography, (optional.)

An elaboration of the above studies, as presented in the full programme, I do not deem important; but as the domestic economy section is an important one everywhere, and, as a branch of study, or rather department, demands especial attention I give this part of the course of study in detail.

1. Under the head of sustentation, the course in domestic economy embraces knowledge of alimentary substances, particularly the origin of various kinds of food, the amount of nutrition contained in each, their digestive qualities, their distinctive qualities, the adulterations to which they are liable, and the appropriate tests for their detection; animal food, including butchers' meat, poultry, fish, oysters, eggs, milk, butter, and cheese; vegetable food, including bread and flour stuffs, pulse, saccharine matters, garden vegetables, edible fruits, infusions, fermented drinks, salts, condiments; the most wholesome, most nutritious, and at the same time cheapest articles of food.

2. The preparation of food and drinks is considered under the following heads: The object of cooking; the kitchen as the physico-chemical laboratory of woman, its location, position, and arrangements; the hearth and its arrangements; fuel and fire; the cheapest materials for heating and lighting; kitchen utensils and the mode of using them; manner of testing utensils before purchase; water, hard and soft; rational boiling and roasting; Papin's pots; the most advantageous and speedy

methods of preparing meats, pulse, and other vegetables; toasting and baking; preparation of cold and hot drinks.

3. Preservation of food is subdivided in the following manner: Fermentation, spirituous, vinous, and putrid; causes of putrefaction and means of preventing it; hanging or drying; evaporation, boiling, and reboiling; preservation in hermetically sealed vessels; salting, smoking, pickling, preserving in sugar.

4. Knowledge of alimentary stuffs, and of household goods and materials, in connection with the instruction in the knowledge of commercial goods, illustrated by specimens in the museum of the school.

5. The study of various domestic functions, such as the care of furniture, bedding, and house-linen; sanitary laws; nursing of the sick; treatment and management of servants; keeping of family accounts.

The number of ladies receiving instruction in this institution the first year of its opening was forty-nine, and the growing interest manifested in the enterprise indicates that its accommodations will very soon require to be enlarged.

The example set by Berlin in the establishment of this remarkable institution appears to me most worthy of attention and imitation by every large city in the world. Nor is there room for question whether many of the subjects taught in both the commercial and domestic economy sections of the school could, with great advantage to both individuals and households, be introduced as essential parts of the courses of study in the schools for young ladies everywhere.

BELGIUM.

The Superior Institute of Commerce at Anvers, in Belgium, is another notable example of the recently founded schools for commercial instruction, and presents some peculiar features which render it especially worthy of notice in this place.

It was established in 1852, by the government of Belgium, in concurrence with the municipal government of the city where located, and has since undergone successive improvements, under ministerial decrees, until it now appears very fully to meet the desires of the government and the commercial community.

The price of matriculation in this school is five dollars, payable annually, after which the applicant for admission to what is called the general course is examined by a board, members of which are named by the minister of the interior, and presided over by the director of the institute, in the professional branches taught in the atheneums of the kingdom, as well as in the preparatory course of the institute; the only exceptions being in favor of candidates who have either completed their first professional year in an atheneum, or have obtained a certificate of *primus* in any German gymnasium; provided they possess a sufficient knowledge of the French, which is the language of the institute, and of two other languages. The tuition for this general course, the duration of which is one year, is $50.

Admission to the instruction given in the special course is only granted to those who have obtained the title of pupil of the second year, and have passed an examination in the branches taught during the first year. The fee for this course also is $50.

Persons wishing to take separate courses can do so without examination, on payment of eight dollars for the first course and four dollars in case of the renewal of their inscription in the same department. Such pupils, however, receive no diploma. For the convenience of persons not sufficiently instructed in science and modern languages at the literary schools, as well as of foreigners who need first to acquire a better knowledge of the French language, in which the instruction is given, and some preliminary acquaintance with the other languages spoken in the counting-rooms of the school, a preparatory course, similar to that in the *Handelsacademie* of Vienna, has been established, in which the studies taught are the following: The French, German, and English languages; history and geography; arithmetic, algebra, and geometry; chemistry, physics; book-keeping and writing.

The course of instruction in the institute proper embraces two years, and is both theoretical and practical, the branches taught being as follows:

Theoretical division: General history of commerce and industry; commercial and industrial geography; political economy and statistics; general principles of law; comparison of commercial and maritime rights, and the principles of international law in their relations to commerce; the customs and laws of Belgium, and the other principal countries; study of constructions and maritime armaments.

Practical division: Commercial affairs and banking; accounts and the management of books, correspondence, &c., in the practical bureau of the institute; study of natural productions and of merchandise; correspondence in the German, English, Spanish and Italian languages.

The lessons in the theoretical department are principally by lectures, the students taking notes and undergoing subsequent examination upon the subject-matter. In the bureau of the institute the instruction is more individual and personal, and all the transactions between the pupils in their capacities as merchants are conducted in the languages of the countries which they respectively represent.

The hours of study in the practical division are during the usual banking hours, and the lectures take place in the morning, afternoon, and evening, so that they may be attended by business citizens and young men looking to the mercantile profession, but failing of the time or means of a regular course.

The instruction is given by eight full professors, two assistants, and three under-chiefs of the bureau, and is well supported by numerous collections like those already mentioned in my notices of the French and Austrian schools.

Graduation takes place after a satisfactory examination before a com-

mission appointed by the minister of the interior, and the diploma awarded states whether the graduation was "with credit," "with distinction," "with great distinction," or "with the greatest distinction." Such as attain diplomas of highest distinction may receive a bursary for travel in foreign lands. The government granted this favor to three pupils in 1864, to enable them to improve their commercial knowledge in the West Indies, in Mexico, and in the Asiatic ports; and since that time five others have been subsidized in like manner—two for travel in the United States and Mexico, and three, with the title of pupil consul, for temporary study in foreign commercial cities.

Whether viewed as individual schools eminently useful in the countries where found, or as the representatives of a class of institutions long demanded by the interests of commerce everywhere, and now growing up in many lands, they constitute a very interesting feature of the educational movement of the present century. I have been thus particular in reporting them, because of the importance to this country of a better public appreciation of what, in this same direction, our own commercial and financial interests require.

II.—NAVAL AND MILITARY SCHOOLS.

In view of the great importance of this branch of education, not merely as a general question, but in its relations to the interests of this country, I had desired and intended to present, in some form for public use, a full and systematic comparison of the regulations governing military education in the leading countries of Europe; and to this end had made special visits to the superior military schools of England, France, Italy, Austria, Prussia, and Russia. In consideration, however, of the very able manner in which the more vital points it was my design to illustrate have been already presented to our country and government by some of its ablest educational and military men, and especially as it seems imperative that this report, already carried in volume beyond the limit of my intent, should be curtailed, I have determined to confine the military section chiefly to conclusions.

Concerning the proper age for introducing young men to the study and discipline of military schools, we have, in the United States, long been very seriously, and to some extent are still at fault. While the leading governments of the Old World, after an experience many times longer in duration than the whole period of our national existence, have, one by one, increased the minimum required of candidates for position in their naval schools from twelve to fourteen and sixteen years, and of candidates for cadetships in the military academies from fourteen to eighteen, (the minimum lately required by England,) we are still maintaining the minimum for those two classes of candidates at fourteen and sixteen respectively, and doing so in the face of what are demonstrable, on philosophic grounds, as the best interests of both pupils.

and service, and regardless of the greatly improved results obtained by those governments which have raised the minima in recent years.

In regard to natural endowments, our system has been no less faulty; providing, as it does, merely against serious physical deformity and disease, and not at all for that clearness, vigor, and aptitude of mind, and for those high moral qualities, all of which are indispensable to the highest power and success of the soldier destined for the command of men, whether on the sea, in the garrison, or on the field.

Touching the educational qualifications demanded of candidates for admission to our military schools, the prescription of mere ability to read and write, and perform with facility the various operations of the ground rules of arithmetic, of reduction, of simple and compound proportion, and of vulgar fractions, it is hardly possible to use milder language than that such conditions are an injustice to the intelligence of our people, and a disgrace to both people and government. The days of 1812 are past, and we are no longer "a few people in the wild woods of North America."

On this head I cannot forbear making comparison of our standard with those of two or three of the European powers.

AUSTRIA.

In Austria, whose rank is not that of a first-class military power, instead of one single institution, like our West Point Academy, there are three general classes of schools, each variously subdivided, and some of the subdivisions embracing numerous schools.

The three general classes are:

1. Institutions designed for the education of pupils as non-commissioned officers—including 10 "lower military houses of education," 10 "upper military houses," and 20 "school companies."

2. Institutions designed for the education of pupils as officers—including the "cadet schools," of which there are four, with 200 pupils each, and "military academies," of which there are also four.

3. Perfecting and special military educational institutions—including a "military normal school," the "higher course for the artillery and engineers," and the war or staff school.

Of the several schools, the military academies included in the second class demand attention in this connection, their object being to educate officers in the higher military subjects for the different arms of the service. They are the Neustadt Academy, the Artillery Academy, the Engineers' Academy, and the Marine Academy.

In the Neustadt Academy, which corresponds in general character to our own, being designed to qualify pupils for the more general service, the educational qualifications for admission are the ability to pass a thorough examination in the German language, including the rules and art of correct speaking, prosody, and rhetoric; natural history, botany, zoology, and geology; French language—translations from French into

German, and German into French; geography, history, geometry, plane trigonometry, with the applications of algebra and the solution of geometrical problems, and drawing.

The course of study in the academy, with these qualifications for entrance upon it, occupies four years, and includes theology, French, Italian, Bohemian, and Hungarian; logic and psychology; physical geography; history; analytical geometry, and higher mathematical analysis; mechanics, with spherical trigonometry; mathematical geography and triangulation; natural philosophy; chemistry; practical mensuration, and sketching maps at sight; descriptive geometry; military composition; actual international law; Austrian civil law; military penal law and mode of procedure; pioneer service, with field fortifications; permanent fortifications; civil architecture; arms and munitions; study of ground and positions, and military drawing; army rules and regulations, and military administration; rules of infantry drill and exercise; rules of cavalry drill and exercise; maneuvering; riding, gymnastics, fencing, dancing, and swimming.

After the completion of this course of study, the thoroughness of which in the manner of teaching is certainly excelled nowhere in this country, the pupils are recommended by the war department to the Emperor for nomination as second lieutenants of the second class.

PRUSSIA AND RUSSIA.

In Prussia and Russia, the systems of military education being no less complete and thorough, the standard is equally high, and in some respects more advanced.

GREAT BRITAIN.

In England, long the really strongest military power, the educational qualifications for admission to the Royal Military Academy at Woolwich are even higher than those above given as being demanded by Austria, to wit: A knowledge of simple and practical mathematics; English literature; geography and history; Greek and Latin classics; French language and literature; German language and literature; chemistry and physics; mineralogy and geology; geometrical and landscape drawing—a degree of preparation about equal, if not superior, to that implied by our bachelor's diploma.

On the 23d day of June, 1868, the Queen appointed a commission to inquire into the present state of military education in the United Kingdom, and more especially into the training of candidates for commissions in the army, and into the constitution, system of education and discipline of the Royal Military Academy at Woolwich and of the Royal Military College at Sandhurst, as well as into the rules and regulations under which candidates are admitted into those colleges.

This commission have recently made their first report, (Blue Book No.

22,357, 1869,) from which the following statement of the number and organization of the institutions for military instruction is extracted:

"At present the professional education of officers of the British army, both before and after they have joined the service, is under the control of a council of military education. This body was instituted in 1857. It is composed of five members, of whom one is a civilian. They are appointed on the recommendation of the commander-in-chief, with the concurrence of the secretary of state for war, the commander-in-chief himself being *ex officio* president. The council advises the commander-in-chief on all subjects connected with military education. It supervises the various state establishments of military instruction; it appoints examiners, and regulates the educational conditions under which direct commissions are distributed.

"The present organization, under the direction of government, for the general administration of instruction in military subjects comprises the following institutions:

"The Royal Military Academy at Woolwich.

"The Royal Military College at Sandhurst.

"The Royal Engineer Establishment at Chatham.

"The Department of Artillery Studies at Woolwich.

"The Advanced Class of Artillery Officers.

"The School of Gunnery at Shoeburyness.

"The Repository at Woolwich, a branch of the School of Gunnery.

"The Staff College at Sandhurst.

"The Survey Class at Aldershot.

"The School of Musketry at Hythe.[1]

"Of these institutions the Engineer Establishment, the School of Gunnery, the Repository, and the School of Musketry, are not under the direction of the council of military education. The three former are of a purely regimental character, and are conducted by regimental officers.

"As subsidiary to these establishments there may be reckoned the examination systems which have been introduced for the purpose of ascertaining the general educational fitness of all officers who obtain a direct commission, as well as the professional competence of those who are promoted to the ranks of lieutenant and captain.

"Of the institutions above enumerated the Royal Military Academy at Woolwich, and the Royal Military College at Sandhurst, are the only establishments under government which exist for the purpose of giving a special education to young men before they enter the army.

"The Royal Military Academy at Woolwich is devoted solely to the instruction and training of candidates for the artillery and engineers, and a course of instruction at the academy is a necessary qualification for admission to these corps.

"The number of cadets under instruction at the Royal Military

[1] The inquiry did not extend to the School of Musketry, as that institution is one intimately connected with the training of the rank and file of the army.

Academy averages about two hundred. Admission is obtained by open competition, but the candidate must be between sixteen and nineteen years of age.

"The subjects of the examination for admission embrace mathematics, classics, English language and composition, English history, modern geography, French, German, Hindoostanee, experimental sciences, natural sciences, and drawing. In the marks assigned to the various subjects a considerable preponderance is given to mathematics and classics, especially to the former.

"A candidate can only compete in five subjects, of which mathematics must be one. The others may be chosen by himself. In order to qualify, however, every candidate must attain a certain standard of proficiency in the lower branches of mathematics, (arithmetic, algebra, Euclid, and plane trigonometry,) in geometrical drawing, and in either French, German, or Hindoostanee.

"The cadets remain two years and a half under instruction, during which period the course of study is almost entirely of a professional character. Examinations are held half-yearly, which determine the promotion of the cadets from class to class. At the end of the course the first class undergo a final competitive examination, which regulates the order in which they receive their commissions. A certain number of those who stand highest on the list are allowed to enter the engineers, if they prefer doing so, the remainder receiving commissions in the artillery.

"The discipline of the academy is intrusted to a lieutenant-governor, assisted, except during the hours of study, by a staff of military officers, who conduct the drills and exercises, but have nothing to do with the rest of the instruction. This is conveyed by a body of professors and masters, who are composed partly of military officers and partly of civilians.

"The Royal Military College at Sandhurst is maintained for the purpose of educating a limited number of young men about the cavalry, guards, and line; to the most distinguished among whom commissions without purchase, to the number of about eighty, are annually granted.

"The limit of age for admission to the college, except in the special case of students of the universities, is from sixteen to nineteen. All candidates are nominated by the commander-in-chief and then admitted to a competitive examination held half-yearly, with the exception of twenty young men known as the Queen's cadets, the sons of officers of the army, navy, or marines, who have died on service and have left their families in reduced circumstances, to whom direct admissions are given by the secretary of state for war, and of a similar number of Indian cadets, the sons of persons who have served in India in the military or civil services of her Majesty or of the East India Company, who are nominated, without any restriction, by the secretary of state for India. From these two last classes of candidates only a qualifying examination is required.

"The examination is of the same general character as for admission to Woolwich, but the actual subjects and the allotment of marks are somewhat different. Mathematics and classics are placed on the same footing, and the number assigned to each is treble that allotted to any other subject. There are in all nine subjects of examination, but a candidate can only take up five. In two of the subjects, viz., in mathematics (arithmetic, algebra up to simple equations, and the first three books of Euclid) and in the English language and composition, a fixed minimum qualification is obligatory on every candidate. Of the remaining subjects any three may be chosen. As it generally happens that there are vacancies enough in the college for all the candidates who qualify, there is practically no competition for admission.

"The course of study at the college lasts, under ordinary circumstances, for eighteen months. The subjects taught are mostly of a professional nature, comprising mathematics, fortification, military sketching, military history, French, German, chemistry, geology, and landscape drawing.

"At the conclusion of the course the cadets pass through a competitive examination. A certain number of commissions without purchase are awarded to those who stand highest in order of merit; the remainder, provided they obtain the necessary minimum number of marks, are qualified for commissions by purchase, and have prior claims for such commissions over all candidates who have not passed through the college. The Queen's and Indian cadets obtain commissions without purchase on merely passing the qualifying examination.

"The constitution of Sandhurst is, in its general features, similar to that of Woolwich; the duties of enforcing discipline out of study hours and of imparting instruction are in separate hands, the former functions being confined almost entirely to the military staff of the college, who form a body quite distinct from the professors and instructors.

"Both at Sandhurst and Woolwich an essentially military character is given to the educational system. The cadets wear uniforms; drill, gymnastic exercises, and riding form an important portion of their training; they are subjected to a form of military discipline, and the punishments inflicted are of a military character.

"The payments required from cadets at Sandhurst and at Woolwich are also regulated on the same principle of a graduated scale. The charge for the sons of private gentlemen is, however, less at Sandhurst, being only £100 a year, as against £125 a year at Woolwich. Queen's and Indian cadets at Sandhurst not only receive a free education, but are provided with uniform and certain fixed allowances at the public expense.

"The only other educational organization affecting the young officer before he joins the service consists of a system of examinations for direct commissions by purchase. At stated intervals examinations are held at Chelsea, under the superintendence of the council of military

education, which candidates nominated to a commission by purchase are required to pass.

"The limits of age are as follows: From 17 to 20 for the infantry; from 17 to 22 for the cavalry; from 17 to 26 for the colonial corps.

"The subjects of examination, the allotment of marks, and the conditions required for qualification, are almost identical with those adopted at the examination for admission to Sandhurst. The successful candidates are arranged in order of merit, and, as a general rule, are commissioned according to the place they occupy in the examination lists.

"Students of the universities who have passed the examinations necessary for a degree become, *ipso facto*, qualified for commissions by purchase, and in their case the limits of age are extended to twenty-three years for the infantry, to twenty-five for the cavalry, and to twenty-eight for the colonial corps."

FRANCE.

In France the candidate for admission to the *École Impériale Speciale Militaire*, at Saint Cyr, which institution is designed to form officers for the infantry, cavalry, *corps d'état-major*, and infantry of marine, must present his diploma of bachelor of science, or, at least, of letters, and undergo two examinations, the first in the department where the candidate resides, or may be stationed, if a member of the army, and the second on arriving at the institution, as follows:

1. Compositions in writing, embracing a Latin translation, a French composition, and a logarithmic calculation; the drawing of a plan in descriptive geometry; the sketch of an academy.

2. Oral examinations in arithmetic, algebra, geometry, descriptive geometry, trigonometry, (plane,) mechanics, cosmography, physical geography, history, and some living language other than French.

Besides these general schools of military science there are, as in Austria, Prussia, England, Italy, Russia, and other European countries, special schools for different arms of the service, in all of which, as well as in the naval schools, a grade of qualifications correspondingly high is demanded.

But even the foregoing account does not fully show the real qualifications possessed by those candidates who gain admission, for the reason that the examinations are not made there, as here, in an easy, generous way, regardful of the feelings of candidates and family friends, but, in nearly all countries, are public and competitive.

In our academies the number of places is limited to one for each congressional district, in the Military Academy, and two for each district in the Naval Academy; and there are no other national military schools. There can be no question, therefore, that if the standard were made very high, as high as in England or France, and the places were offered to those who, in competitive examinations before competent authorities, should prove themselves naturally and by education best qualified to fill

them, these schools would be sure of a vastly better class of pupils in every respect, and the country of more worthy and competent officers in time of need.

In most European countries the cadet pays the government large fees for instruction, while in the United States they are not only educated but supported and paid by the government from the day of their admission. And yet statistical tables, published by authority of the government, show that almost fifty per cent. of those who are appointed fail to complete the course of study prescribed.

If in aristocratic England and the other more despotic countries of the Old World they have deemed it essential to the maintenance of high position as military powers that the best endowed and best trained of their youth, the very flower of their young men of genius, should rise to the command of their troops and their marines, and so have resolutely laid the axe at the root of privilege, by offering its highest rewards to such as demonstrate their title to them from whatever class they may come, is it not time that we also, in democratic America, abolish the system of favoritism by which appointments are made to our schools of the army and navy?

CHAPTER IX.

POLYTECHNIC SCHOOLS.

RAPID DEVELOPMENT OF POLYTECHNIC EDUCATION IN ALL COUNTRIES—IMPERIAL POLYTECHNIC SCHOOL OF FRANCE—AUSTRIA, PRAGUE, BRUNN, GRATZ—ROYAL INSTITUTE AT VIENNA—PRUSSIA, ACADEMY AT BERLIN—GRAND DUCHY OF BADEN, SCHOOL AT CARLSRUHE—BAVARIAN SCHOOLS AT MUNICH AND OTHER PLACES—HANOVER—SAXONY—SWISS FEDERAL SCHOOL AT ZURICH—ITALIAN SCHOOLS OF TECHNICAL SCIENCE—SCANDINAVIAN SCHOOLS AT COPENHAGEN AND STOCKHOLM—RUSSIA—ROYAL SCHOOL AT STUTTGART, WURTEMBERG—OTHER CONTINENTAL POLYTECHNIC SCHOOLS—GREAT BRITAIN—GENERAL ACCOUNT OF TECHNICAL SCHOOLS IN THE UNITED STATES—MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

The estimation in which polytechnic schools are held in Europe is evidenced by the munificence of governments, associations, and individuals in their establishment, equipment, and endowment. Wherever found, whether in France, where they had origin; in Switzerland, where within a very few years they have had their most remarkable development; in Baden, Wurtemberg, and Bavaria, where, next after the primary schools, they are considered the prime necessity; in Italy, where they are beginning to be appreciated and where the way for their establishment has been paved by the *scuole tecniche*, of which the number is great in that kingdom; in Austria, where at present they hold high rank and are steadily gaining in favor; in Saxony and all portions of enlarged Prussia, where they are making rapid growth and approach more and more nearly, in public estimation, to an equality in rank with the literary institutions; in Scandinavia, where they are recognized as the great desideratum of the present times; in Russia and its dependencies, where instruction in the sciences and their professional applications is deemed the *sine qua non* of their advancing civilization—in short, wherever this new mighty power we call science has forced its way into recognition, there do we find that the most extensive and most magnificent educational institutions are such as have been erected in the interest of science and the industrial arts. No other class of institutions in the world can boast of such splendid edifices, vieing with, and in some cases even excelling, in extent and architectural beauty, the renowned palaces of kings. None are favored with such vast mineralogical, physical, chemical, philosophical, and even art collections and laboratories for illustration and experiment, and none rejoice in abler faculties or more numerous, intellectual, and enthusiastic bodies of students.

Even in Finland, and within the walls of the Royal University, (at Helsingfors,) I have found the fires of this new enthusiasm for science brightly burning. The already extensive buildings devoted to chemistry, natural history, and natural philosophy are no longer felt to be

adequate, and to-day a new edifice, more extensive than any university building in America, is rising to its third story, for the better accommodation of what is to be the polytechnic department of the flourishing Finnish University.

Naturally, the details of organization are somewhat different in the different countries where schools of this class exist; nevertheless, their main features are everywhere the same, and the title of polytechnic, by which they are almost universally known, is generally expressive of their objects and character, as schools for instruction in many arts, though, in at least one notable instance, (reference is made to the Polytechnic School at Paris,) the correspondence in the general scope of the instruction is nearer to the type of the American scientific schools, to which reference has just been made in another place.

IMPERIAL POLYTECHNIC SCHOOL OF FRANCE.

This famous institution was established by the National Convention of France, in the year 1794, at the instance of Carnot, Fourcroy, and other leading men of that time, under the more really descriptive title of Central School of Public Works. The following year the name was changed to Polytechnic School of France. Its present title is Imperial Polytechnic School, *(École Impériale Polytechnique.)* Its unlikeness to most of the other polytechnic schools of Europe and its resemblance to schools of general science consist in the fact that its courses of instruction are not directly connected with the practical arts, its office being rather to prepare the pupil to enter either the general service of the government, should he desire to do so, or to enter special or professional schools, where the direct applications of general science are taught.

Under the present arrangement for the partition of the public institutions among the imperial ministers, the polytechnic school is under the control of the minister of war, by whose courtesy I was several times privileged to examine into its condition and mode of management.

Its declared object is to prepare pupils for the following public services: the artillery service on land and sea, military and maritime engineering, the imperial marine, the corps of hydrographic engineers, the commissariat of the navy, the department of bridges, highways, and mines, the corps of *état-major*, the manufactures of the state, the department of the telegraph, and, finally, for other public services which demand an extensive acquaintance with the mathematical, physical, and chemical sciences, and which may be added by future decree to the branches of public service above specified.

The organization of the institution is such as to secure efficient management and the admission of such pupils only as are likely to prove valuable acquisitions to the public service.

The institution is wholly under a military *régime*, and the chief officer of the school is known as the commandant. Subordinate to him, and in immediate charge of all matters of instruction, is the director of studies,

who is appointed by imperial authority, and who, together with the commandant, the professors, a representative of the subordinate teachers, and the secretary, constitute a council of instruction, whose duty it is to have stated meetings for the consideration of matters within their spheres of labor and to refer all matters requiring further attention and decision to the Council of Improvement, consisting of the director, a certain number of examiners, members of the Academy of Sciences, and officers representing the different branches of public service preparation for which is the object of the school.

Admission is granted only after a series of the most rigid examinations, first, in the several districts of the empire to which, on the nomination of the Council of Instruction, four or more competent persons are deputed for that purpose at certain stated times by the minister of war; and, secondly, by a board of examiners at Paris.

In order to be admitted to the examination, candidates are required to show that they are of French birth or have been naturalized; that they have attained the age of sixteen years and were not over twenty on the first of January of the year of the examination; and that they have received the diploma of bachelor of science or of letters. Military candidates from the army corps are admitted exceptionally to the examinations up to the age of twenty-five, on showing that, by the first of January next succeeding, they will have completed two years of service under the flag of the empire. They can only be assigned to the military service, however, on completing their studies.

Civil candidates must enroll themselves as such with the prefect of the department of the empire where they studied; military candidates, at the prefecture of the department in which they are garrisoned. Non-military candidates may be examined either within the district where their families reside or within that which embraces the place of their preliminary study. Military candidates must undergo examination at the places assigned for the examinations in the particular department in which their army corps is in garrison.

The documents necessary for the inscription at the prefecture are, first, proof of requisite age; secondly, a duly legalized declaration, by a physician or surgeon connected with some military or civil hospital, to the effect that the candidate has had the varioloid or that he has been vaccinated, and that he has no contagious disease or physical infirmity that would unfit him for the public service; thirdly, the diploma of bachelor of science or of letters, or a document showing his title to one; fourthly, a written declaration of the place of examination chosen by him or his family.

The examinations for admission are both written and oral, and no candidate can be admitted to the oral examinations unless he has first passed the written examinations in a satisfactory manner. There are also two degrees of oral examination. Examinations of the first degree serve to establish whether the candidate has sufficient qualifications to

entitle him to an examination of the second degree. Examinations of the second degree determine the classification in order of merit of those admitted to the final examinations. Candidates who have been successful at the first general ordeal are admitted in order of rank, according to the registers of the examiners, made with reference to a definite scale, and, from the number of successful candidates reported, the board of final examination, consisting of the commandant, director, and regular examiners of the school, together with the original examiners of the candidates, then select such as, at this competitive trial, prove themselves most competent in all respects to fill the existing vacancies.

The examinations are in arithmetic, geometry, algebra, plane trigonometry, analytical geometry, descriptive geometry, physics, chemistry, French language, and design, conformably to official programmes adopted by the minister. Candidates may also present evidence, by thesis and translation, of an acquaintance with any one of the five following languages, to wit: German, English, Italian, Spanish, or Arabic.

The written compositions required of candidates must bear upon each of the scientific branches of which a knowledge is required, and must include, moreover, a French composition, a plan in descriptive geometry, a colored and a crayon design.

The full term of study is two years; price of boarding and lodging, 1,000 francs ($200) per annum; cost of wardrobe about 600 francs. For the benefit of poor young men of merit some twenty or more gratuities (bursaries) and half-gratuities, as well as outfits and half-outfits, or trousseaux, are granted each year by the minister of war, on the recommendation of the two councils of the schools—the council of instruction and the council of administration.

Students of the school are divided into two sections, corresponding to the two years duration of the term of study; and no pupil can pass from the first section into the second until a satisfactory examination has been passed in all the studies of the first year; nor can any pupil remain in the same section more than two years, or in the school more than three.

The courses of instruction belonging to the first year embrace differential and integral calculus, statics and dynamics, problems in physical astronomy, problems in descriptive geometry relating to the right line and plane, tangent planes and normals to plane surfaces, &c.; applications of analysis to geometry, elements of machinery of various kinds, general physics, including the properties of bodies, the principles of equilibrium of fluids, constitution of the atmosphere, &c.; general chemistry, the general principles of architecture, essays and other exercises in the French language, elements of the German language, and topographical drawing.

The second year is devoted to the continuation and completion of mathematical analysis, and the study of forces applied to an invariable system, the principle of virtual velocities, hydrostatics and hydro-

dynamics, applications of geometry to problems with a single plane of projection, linear perspective, shadows, &c.; astronomy and geodesy in their various branches, elements of the calculation of probabilities, (applicable to insurance, &c.,) electricity, magnetism, acoustics, and optics; the conclusion of inorganic chemistry, including the methods of extracting metals from their ores; organic chemistry, architecture, French composition, German themes and translations, topographical landscape and figure drawing.

The instruction in the theoretical branches is chiefly given by conversational lectures and by frequent interrogations by the professors and repeaters. Formerly pupil teachers were employed, but now the assistants, known as repeaters, perform the service once assigned to them, and to a still greater extent relieve the professors. During the interrogations a careful record is made of the general correctness of answers made by the several pupils, and at stated times these records are reported to the director.

At the end of the full period of study there are thorough examinations on all the branches taught; each pupil being examined singly and alone, and credited on each branch according to his proficiency therein; and then the board of examiners, on comparing notes, and according merit for proficiency in the several branches in the order following, to wit, first, mathematics; secondly, topographical and other drawing; thirdly, geometry (descriptive) and geodesy; fourthly, physics and chemistry, determine who shall be entitled to graduation. Such students as have passed the examinations with the most credit, and hence stand first on the list, are then permitted to choose the particular branch of the public service they will enter. Should any graduate from highest in merit to lowest choose a branch of the service in which there are no vacancies, he still has priority over all below him in making successive choices until a vacancy be found.

In some departments of the service graduates of the polytechnic school are received at once, in subordinate positions, as apprentices, for a term of three or more years; but admission to the most of the departments of service can only be gained after still another course of study in a special school, continuing from two to four years.

In giving the foregoing account I have been thus particular, in order that the great care with which, in France, the avenues to positions of responsibility are guarded by regulations that test capacity and determine fitness, might the more fully appear.

The polytechnic schools of all other countries more strictly conform to the idea conveyed in the title they bear; and yet none of them are solely polytechnic, if we use that word in its etymological sense, since all embrace a preliminary course of instruction in general science of from one to two years in duration; thus combining in one institution what the Imperial Polytechnic School of France would embrace if it included all the several technical and professional schools to which it

really stands, as before remarked, in the relation of a high preparatory school.

AUSTRIA.

The polytechnic schools of Austria are next in order of time and likewise hold high rank. The first established was the Technical Institute at Prague, founded in 1806, which embraced a two years' preparatory and a three years' technical course of instruction. Since that date, others have sprung up, and, at present, besides four, which are extensive and prominent—at Prague, Vienna, Gratz, and Brunn—there are several less important ones in the various provinces.

Of the polytechnic schools proper, it was my privilege to visit all except the one at Brunn. Pre-eminent among them, and therefore entitled to represent them as a class, stands the school at Vienna, one of the noblest and most useful in Europe.

The Royal Polytechnic Institute at Vienna was founded in 1815, and has always enjoyed the favor of government and people. The magnificent buildings recently constructed for its use occupy a most eligible position in the heart of the city, and are admirably adapted to its uses; including, besides the large number of apartments necessary for study, practical exercises and lectures, a series of extensive, well-furnished, and well-equipped laboratories, cabinets, &c., for the use of professors and students. Formerly there were also connected with the institute extensive workshops, in which geodetic and astronomical instruments of high repute were manufactured for sale throughout the empire and to other parts of the world. Under the present organization, however, the shops are solely for instructional use.

The school embraces two general divisions—the technical and the commercial—besides a preparatory department, and is presided over by a rector, assisted by a pro-rector.

The technical division embraces four special courses or schools, to wit: The school of engineering, the school of architecture, the machinist's school, (*Maschinenbauschule,*) and the school of technical chemistry.

The duration of the preparatory course is two years for students designing to enter either of the three first-named schools; but pupils preparing for the school of chemistry may pass from the preparatory school at the end of the first year.

The conditions of admission require of the applicant for entrance into the preparatory school evidence of preliminary study and due proficiency and of moral character. Admission to the technical schools can only be granted to persons at least sixteen years of age and of certificated moral character, who either are possessed of certificates showing that they have completed a full course in a gymnasium or real-school, or are found capable of passing an examination showing equivalent attainments. They must also furnish guarantees that they will promptly pay all dues for tuition and incidental expenses.

The matriculation fee to be paid by students of all classes is 4 florins

20 kreuzer, (about $2;) tuition, per half-year, in either division of the school, 12 florins 60 kreuzer, ($6 50;) for facilities in the laboratories, 10 florins to 20 florins extra.

Extraordinary students—persons not wishing to take a full course, simply to attend certain lectures or courses for a limited time—are admitted on terms made by the several professors whose instruction they wish to attend.

The school-year begins October 1 and ends August 1.

The instruction embraces lectures, practical exercises in the various laboratories, and excursions, and is given by the rector, pro-rector, the principals of the several schools, 19 public ordinary professors, 4 public extraordinary professors, 6 private teachers, (*Privat-docenten*,) 7 instructors, 3 extraordinary instructors, 6 adjuncts, and 11 assistants.

The studies included in the preparatory school for the two years are as follows:

First year. Algebraic analysis; analytical geometry; elements of differential and integral calculus; descriptive geometry; construction drawing; inorganic chemistry; principles of botany; practical botany; technical and free-hand drawing.

Second year. Differential and integral calculus completed; general physics; technical mechanics; practical geometry; topographical drawing; construction exercises based on descriptive geometry; technical and free-hand drawing.

The duration of the full course in the school of engineering is three years, and includes the following branches of study:

First year. Technical physics; general knowledge of machinery, (*Maschinenkunde;*) architecture; architectural exercises; geology and geological exercises; the mechanics of architecture; ornamental drawing.

Second year. Analytical mechanics; geodesy; hydrography; exercises in construction; bridge-building; topographical drawing.

Third year. Construction of roads and railways; exercises in construction; history of architecture.

The full course in the school of architecture embraces two years. The following are the branches taught:

First year. Architectural construction and architectural exercises; general study of machinery used in practical architecture; theory of architectural construction; ornamental drawing.

Second year. Architecture as a fine art; exercises in architectural drawing; history of architecture; ornamenal drawing and modeling.

The school for machinists likewise embraces two years—

First year. Analytical mechanics; study of machinery; machine construction; exercises in constructions; mechanical technology; technical physics.

Second year. A second course in the study of machinery; second course in machine construction; construction exercises and designing and sketching.

The school of technical chemistry embraces three courses of a year each—

First year. Organic chemistry; analytical chemistry; work in the laboratory; general physics; technical mechanics.

Second year. Chemical technology; work in the laboratory; technical physics; general study of machinery; knowledge of articles of merchandise, (*Waarenkunde,*) and the adulterations to which they are subject.

Third year. Work in the laboratory; mechanical technology; geology (second course;) geological exercises.

The commercial school embraces a two-years' course of study of the following subjects: Book-keeping by single and double entry; commercial arithmetic; the science of trade; commercial correspondence; merchandise, or the materials of trade and the impositions practiced in the various branches of manufacture; the laws of Austria regarding trade, exchange, insurance, &c.; commercial geography; statistics of the European states; and commercial history.

Instruction is given, by several professors, in French, English, Italian, Persian, and Turkish languages, and in Vulgar-Arabic, but the study of none of them is included as an essential part of the regular courses.

Regular and extraordinary lectures are likewise given on the German classics, æsthetics, political economy, agriculture, and many other subjects, which such of the pupils as are able to do so are encouraged to attend.

On the completion of any of the full courses of study, such students as undergo a satisfactory examination receive the diploma appropriate to the several departments in which they have studied. Students not taking a full course may be examined and receive such certificate as their attainments entitle them to.

During the year 1867 there were, in the aggregate, nearly a thousand students in attendance upon this institute.

PRUSSIA.

Polytechnic education in Prussia is furnished to an extent commensurate with the zeal and enterprise of that country, but, except such as have become Prussian by recent absorption, like the one at Hanover, they all bear other titles than polytechnic. Among the most important of them is the Royal Industrial (*Gewerbe*) Academy at Berlin, founded in 1821.

This institution was designed to furnish thorough instruction in the applications of science to the mechanical arts, (including especially architecture, machine-building, and ship-building,) and in chemical technology and mining.

Each general department embraces two divisions, the course of study in each division occupying one and a half year. Instruction in the first division is largely or entirely theoretical; in the second, largely practical.

The institution is under the general direction of the minister of com-

merce, industry, and public works, the more immediate management being intrusted to a college of trustees consisting of one officer of the ministry, the director of the academy, two professors, and two other scientific persons not connected with the school.

The annual appropriations made by the state amount to from $40,000 to $45,000, and tuition is merely nominal.

The terms of admission require that the applicant shall be between the ages of seventeen and twenty-seven; that he shall present the usual certificates of moral character, as well as a certificate showing that he has creditably completed a full course of study in a gymnasium, real-school, or provincial industrial school; and, in the case of persons intending to qualify for ship-building, that they have spent one year practically at work in a ship-yard, and that they intend to make ship-building their profession.

Students regularly entering for the whole course must pass through the first division before entering the second, except in the case of students in the chemical department, who are sometimes admitted to the last course after one year's study in the first. Choice of studies is permitted to all except stipendiaries, of whom there are forty or fifty.

Machinists are permitted, after completing the full course of study, to remain one year longer at work in the shops.

In the magnificent buildings provided for the academy there are not only extensive collections, essential to the departments of natural history and physics, as well as superior chemical and technical and even photographic laboratories, industrial collections, and workshops, but likewise a number of the most valuable collections of models in plaster, drawings, plans, and designs connected with architecture, engraving, &c., and with the ornamental arts, that I have found in any such institution in Europe.

The following scheme presents the general course of instruction running through the two divisions:

First division. General arithmetic, including high equations; spherical trigonometry and practical use of trigonometry; differential and integral calculus; statics and mechanics; theory of the mechanical effects of heat; descriptive geometry and its applications to perspective and to making plans for stone-cutting; general and organic chemistry; technical chemistry; general construction of buildings; study of the simple parts of machinery.

Second division. For architects and machinists especially: Theory of the strength and durability of materials; parts of machines and construction of machinery; calculations of complicated building constructions, and theory of the arch; measurement of water and air in artificial conduits; theory of warming and heating apparatus; general theory of machines, their durability and regulation, especially the theory of hydraulic motors and steam-engines; calculations of simple parts of machines; general relations of parts of machines; special mechanics,

power of machines; mechanical technology; chemistry; exercises in drawing parts of machinery; exercises in calculating and drawing power-machines; planning and drawing factory buildings; calculating and drawing such artistic forms as are used for iron castings; mathematical proofs of the principal laws of physics. For chemists and miners: Special inorganic chemistry; special organic chemistry; mineralogy; geognosy; metallurgic chemistry; chemical technology; special mechanics, power machines; exercises in planning and calculating chemical arrangements; laboratory practice. For ship-builders: Principal part of course required for architecture; drawing of ships and parts of ships; art of ship-building, (embracing general discussion, displacement and stability, and hydrostatic calculations;) study of stability, and theory of sail and steamships; general principles regarding the form of ships, and theory of the construction of wood and iron ships.

The above instruction was being given, in 1867, by 24 professors and practical instructors, to 500 students.

GRAND DUCHY OF BADEN.

The Grand Duchy of Baden Polytechnic School at Carlsruhe, founded in 1825, has long enjoyed the reputation of being the most extensive, complete, and thoroughly equipped of all the institutions of its class in Europe, and is therefore entitled to a liberal share of space in this portion of my report.

The main object of the institution is to educate engineers, machinists, architects, chemists, foresters, and agriculturists. Reference is also had to the preparation of such pupils as look to financial economy and positions of that kind in the state for their work. The institution is divided into the following departments: 1. The mathematical school. 2. The school for engineers. 3. The school for machine-builders. 4. The school of architecture. 5. The chemical school. 6. The forestry school. 7. The agricultural school.

The instruction embraces lectures, repetitions, and examinations, graphic and constructive exercises, work in the laboratories and workshops, and excursions.

The means of illustration and practical teaching include a cabinet of natural philosophy; mineralogical and geological collections; zoological and botanical collections; collections of models belonging to the school of engineering; collections of models for the school of machine-building; a collection of models for the school of architecture; technological collections; collection of geodetical instruments; collections illustrative for the department of descriptive geometry; collections of models, ornamental and practical, in plaster; collections belonging to the school of forestry; collections belonging to the agricultural school; and a large library of scientific, technical, and other works.

Besides which there are the following extensive laboratories: a chemical laboratory, one of the best for practice in Europe; a laboratory for

natural philosophy; a mineralogical laboratory; a forestry laboratory; and an agricultural laboratory.

The forestry and agricultural schools are provided with extensive grounds for illustration, practice, and experiment.

The workshops connected with the school, and essential to the scheme of instruction, are four in number, to wit, shops for making models in clay, plaster, and wood, and for the building of machines.

The organization of the school, as it exists at present, is based on a statute approved by the Grand Duke on January 31, 1865, according to which the institution is placed under the immediate management of the minister of the interior. Its particular administration is conducted by a director and two councils. The director is annually elected by the professors and confirmed by the Grand Duke. One of the councils (*kleiner Rath*) consists of the director, his predecessor in office, and three of the professors elected by the faculty and confirmed by the minister. The other and larger council (*grosser Rath*) comprises all the professors.

The applicant for admission to the regular courses must be seventeen years of age at least, and possess such educational qualifications as are prescribed for the different schools. The certificates of age, morality, &c., are similar to those required by other European institutions. The matriculation fee is 5 florins 30 kreutzer, ($2 20;) tuition, 66 florins ($26 40) per annum, payable in advance. Students not pursuing a regular course, but simply attending such lectures as they prefer, (*Hospitanten,*) pay 2 florins (80 cents) for each separate course of lectures running through the half-year, up to the amount of 40 florins, beyond which no further charge is made. The fees for the chemical laboratory are 44 florins per annum for regular students, and for others 60 florins. In the philosophical laboratory the fees are 8 florins per half-year; in the mineralogical laboratory, 2 florins; in the agricultural laboratory, 10 florins.

The several courses in the seven professional schools embrace very thorough and complete instruction in mathematical science; natural sciences; economical sciences; jurisprudence, in its relations to the several professions embraced in the school; history; fine arts; science of engineering in all its branches; mechanics, theoretical and practical; technology; architecture; forestry; agriculture; and foreign languages.

The following is the programme of the several schools:

1. MATHEMATICAL SCHOOL.—The full course embraces two years. The qualifications required for admission are a thorough knowledge of elementary mathematics, to wit, algebra, plane geometry, stereometry, and plane trigonometry. For the benefit of such persons as may not be thoroughly acquainted with all these branches, regular preparatory instruction is given in them by one of the mathematical professors assigned to that work.

First year's course. Application of plane trigonometry and theory of spherical trigonometry; higher equations; differential and integral cal-

culus, (first course;) analytical geometry, plane; descriptive geometry, (first course;) constructive exercises in descriptive geometry, (first course;) experimental physics; free-hand drawing.

Second year's course. Differential and integral calculus, (second course;) analytical geometry; geometry of space; descriptive geometry, (second course;) constructive exercises in descriptive geometry, (second course;) practical geometry, (first part;) plane drawing; surveying excursions in summer; analytical mechanics; mineralogy; geology; mathematical physics; exercises in the physical laboratory; general chemistry, (first course, divided into general and inorganic and organic;) free-hand drawing.

2. SCHOOL OF ENGINEERING.—This school embraces all branches of engineering except the construction of fortifications. The term of study is two and a half years. Applicants for admission must have the general educational qualifications acquired in a gymnasium, as well as a knowledge of the mathematical branches taught in the mathematical school. They must also have the certificate of a physician or surgeon to their bodily qualifications essential to a practice of the profession of engineer.

The instruction in this school is given in three courses—the first two of one year each and the third of one-half year's duration.

First year's course. Durability, (*Festigkeitslehre;*) practical hydraulics and the theory of heating; economical science; free-hand drawing, landscape drawing, and drawing in water-colors; river and street engineering, (*Wasser- und Strassenbau,*) first course; constructive exercises connected with river and street engineering; elementary principles of machinery, (*Maschinenlehre;*) machine-building, (first course;) construction of machines, (first course;) chemical technology; technical course in architecture; drawing and planning of architectural objects, (first course;) scientific principles of building with stone, (*Steinconstructionen.*)

Second year's course. Select studies in mathematical physics; general principles of industry and commerce; general and the most important principles of civil rights; free-hand drawing, landscape drawing, and drawing and coloring in water-colors; river and street engineering, (second course;) railroad construction, and constructive exercises connected therewith; theory of power machines; theory of economical heating; theory of the most important operative machinery; machine-building, (second course;) mechanical technology; drawing and designing of architectural objects; high architecture, (first course.)

Concluding half-year's course. The object of this course is to teach the special applications of engineering in the public service of the Grand Duchy of Baden—river engineering and road construction; the working-up in detail great engineering projects; practical geometry, (second part;) higher geodesy; higher architecture; practical exercises running through the whole term in constructions, planning, &c., and excursions to visit important public buildings and works.

3. THE SCHOOL FOR MACHINISTS.—This school is designed for the instruction of pupils proposing to engage in those branches of manufacture and industrial pursuits, such as the building of machines, &c., as require a thorough knowledge of the higher mathematics. The term of study is three years. A two years' course is also provided for persons whose contemplated pursuits do not necessarily involve a knowledge of the higher mathematics and mechanics. Only such pupils are admitted as have either passed through the first course in the school of mathematics, or are able to pass a thorough examination in the branches therein taught.

First year's course.—Differential and integral calculus, (second course;) analytical geometry; descriptive geometry, (second course;) constructive exercises; analytical mechanics; mineralogy; geology; general chemistry, (first course;) free-hand drawing, landscape drawing, and coloring; science of mechanics, (first course;) construction of machines.

Second year's course.—Practical geometry, in the field; durability and capacity of materials; practical hydraulics; mathematical physics; general economical science; free-hand drawing; landscape drawing and coloring; river engineering and road construction, (first course;) constructive exercises; elements of mechanics; construction of machines, (first course;) chemical technology; metallurgy; work in the mechanical shops, (two hours in the evening.)

Third year's course.—Select studies in mathematical physics; general principles of industry and commerce; free-hand drawing; landscape drawing and coloring; river and road engineering, (second course;) railroad construction; theory of power machines; theory of economical heating; theory of operative machinery in its important applications; solutions of selected and difficult problems in mechanics; mechanics, (second course;) construction of machines; mechanical technology; practical exercises in the machine shops.

4. SCHOOL OF ARCHITECTURE.—The school of architecture embraces two divisions, higher and lower; the entire period of study being four years. The object of the lower division, which includes two courses, is to qualify the student for the duties of superintending the construction of buildings generally and to plan and construct private and other buildings of minor importance. It also serves as a preparatory school for the higher division.

The conditions for admission are not materially different from those required for the preceding schools.

First course in lower division.—Analytical mechanics, five hours a week; descriptive geometry, (second course;) constructive exercises, (second course;) technical mineralogy and petrography; general chemistry, (first course;) economical science; free-hand drawing and landscape drawing; ornamental drawing, (first course;) properties of building materials; architectural statics, (*Baustatik;*) drawing after models and copies, (first course;) modeling in wood; drawing of plans after copies and planning of smaller buildings.

Second course in lower division.—Properties of building materials; principles of industry and commerce; free-hand drawing; landscape drawing and coloring; ornamental drawing, (second course;) river and street engineering, (first course;) modeling in plaster; practical exercises in building arches; drawing and designing of buildings, (second course;) technical architecture, (first division;) designing larger dwellings and farm buildings; architectural estimates.

First course in higher division.—Practical geometry; free-hand drawing; landscape drawing and coloring; figure drawing, (first course;) ornamental drawing, (third course;) painter's perspective; modeling of ornaments from plaster casts and copies; technical course in architecture, (second division;) designing larger dwellings and public buildings; higher architecture, (first course;) history of art, especially including ancient architecture; graphical studies, (first course.)

Second course in higher division.—General and most important principles of civil rights; free-hand drawing; landscape drawing and coloring; figure drawing, (second course;) ornamental drawing, (fourth course;) painter's perspective, (second division;) modeling of ornaments from original designs, and studies in modeling from nature; designs for monumental structures, combined with exercises in decoration; higher architecture, (second course;) history of the architecture of the Middle Ages and modern times; graphical studies, (second course.)

At the conclusion of the fourth year's study the general conditions for an architectural design are submitted to the whole class, and the successful competitor is awarded the prize of a gold medal.

5. School of chemistry.—The professional school of chemistry is designed to meet the wants of such pupils as intend to become naturalists, pharmaceutists, miners, conductors of chemical manufactories, or to devote themselves to the profession of chemical technology. It is assumed that those who would enter are already grounded in the general principles of this and the collateral sciences, and hence the instruction is limited to one course.

Course of study. Crystallography; mineralogy; geology; practical mineralogy; botany; zoology; experimental physics; recitals and examinations in physics; mathematical physics, (optics and electricity;) exercises in the physical laboratory; general chemistry, (first course—general and inorganic;) recitations and examinations; analytical chemistry; geometry; assays of ores and metals; theory of dyeing, (especially referred to the production of dyes from coal-tar;) practical work in the laboratory; general economic science; general principles of industry and commerce; chemical technology and metallurgy.

6. School of forestry.—Applicants for admission must not only comply with the general conditions before referred to, and have passed through a gymnasium, or advanced to the highest class in a lyceum, but must also establish the fact that they possess a sound constitution and are not short-sighted. Such as do not propose to enter into the

service of the state are allowed to select such branches or courses of study as they prefer to pursue. There are three courses of study, to wit:

First course. General arithmetic; plane geometry; plane trigonometry; stereometry; drawing of plans; botany; botanical excursions; zoology; experimental physics, with recitations; general principles of civil rights; preliminary survey of the general subject of forestry.

Second course. Political arithmetic; plane polygonometry; practical geometry; drawing of plans, exercises in surveying, with particular reference to the state regulations for forest surveys; mineralogy; geology; practical mineralogy; meteorology; climate and soil; general chemistry, (first course—general and inorganic and organic;) general economical science; natural history of forest trees; forestry mathematics, with exercises and practical applications; cultivation of forests; uses of forest products, and technology; valuation of timber; practical demonstrations in the forest.

Third course. Agricultural chemistry; general land and forest economy; laws relating to forests and to hunting; solution of difficult forestry calculations; protection of forests and entomology; forest management and statistics; forest plans and valuation; valuation of forest lands; forest products, and relative valuations; forest administration; forest roads and water engineering; constructive exercises and surveys for forest roads, &c.; forest police; development and history of forest literature; practical demonstrations in the forest; lectures and labors in the forest seminary and laboratory; principles of the cultivation of plants, (agricultural.)

7. Agricultural School.—The objects of this school are, first, to give to young men, who are to devote themselves to agriculture, a scientific basis for their calling; secondly, to provide practically educated agriculturists an opportunity to acquire a solid scientific education; thirdly, to enable students of the political sciences to gain a knowledge of the most rational system of agriculture. It is the purpose, however, simply to ground the pupils in the principles of the science and art as based upon the mathematical, physical, and natural sciences, and political economy, and not to attempt instruction in actual agricultural practice.

The term of study is two and a half years. During the first course, which embraces three half-year courses, the instruction is exclusively confined to the sciences on which agriculture is based. At the opening of the second course, the duration of which is one year, the applications of science to agriculture as a profession commence. This final course is also so arranged as to afford time for the pupils to avail themselves of the opportunities afforded by the lectures in the other schools to acquaint themselves more fully with those sciences which are essential to a higher general culture.

The educational qualifications demanded for admission to the agricultural school are such as are usually provided by the burgher or citizens'

schools of the German states. It is recommended that pupils enter at the beginning of the school year, (October 1,) as it is only in this manner that they can thoroughly complete the full course of study in two and a half years. Nevertheless, such applicants for admission as have already acquired a knowledge of the branches included in the first course may, at the discretion of the director, enter at once upon the second course. Persons of riper years, who do not wish to pursue a complete and thorough course of study, are also admitted to the privileges of the school as auditors, (*Hospitanten.*)

The courses of instruction are as follows:

First and second half-years of first course. Trigonometry; elementary mechanics; mineralogy; geology; botany; botanical excursions; zoology; experimental physics; recitations in physics; general chemistry, (general and inorganic part, and organic;) general economy, including the more prominent principles of political science; anatomy and physiology of domestic animals.

Third half-year of first course. Practical mineralogy; practical botany and zoology; exercises in the physical laboratory; meteorology, climate, and soil; agricultural chemistry; practical work in chemical laboratory; chemical technology of organic substances; practical animal physiology.

Second course. Surveying and drawing of plans; practical mineralogy; botanical excursions; practical botany and zoology; agricultural entomology; practical operations in the chemical laboratory; general and more important principles of civil rights; general principles of agriculture and forestry; general arrangement and management of farms, including agricultural book-keeping; principles of the valuation of lands and agricultural products; and finally, cultivation of plants, including chemical composition and histology; food of plants; conditions of assimilation; mode of assimilation of food; arable soil, its origin, composition, and adaptations; atmospheric air, its composition, the distribution of rain, and the relations of air to vegetation; preparation of the soil, including drainage, irrigation, amelioration by mixtures of clay, muck, and natural fertilizers generally, working of the soil, manuring, covering and shading of the soil, rotation of crops, fallowing, sowing and planting, treatment during growth, and harvesting; general and special cultivation of each of the ordinary agricultural plants; cultivation and management of meadows; vineyard and orchard culture; care of domestic animals; points of domestic animals; principles of shoeing; principles of breeding, (embracing several divisions;) agricultural machines and implements; agricultural dissertations or discussions; agricultural excursions—every two weeks one, occupying a half day, and two or three more extended ones during the term—and practical operations in the agricultural and forestry laboratory.

It is perhaps needless to add that the instruction in this great school is no less thorough than the array of studies is extensive. The corps of instruction consists of twenty-six professors, and seventeen adjunct pro-

fessors and assistants, and includes some of the ablest teachers in Germany. The collections and laboratories—especially the chemical laboratory, one of the best planned and equipped that I have found anywhere—together with the library and spacious apartments for lectures, exercises and demonstrations, constitute an *ensemble* of which the wealthiest kingdom in the world might well be proud.

The number of students in actual attendance at the date of my visit in 1867 was 501, including representatives of twenty-six different countries, kingdoms, and duchies; and the number sometimes reaches a still higher figure.

BAVARIA.

The polytechnic schools of Bavaria, including those of lower as well as those of higher grade, number over twenty. Chief among them, and eminently worthy of the high title it bears, is the Royal Polytechnic School, located at Munich.

Founded in 1833, and ever since ably managed, it has exerted a powerful influence upon the industry of Bavaria, and contributed not a little to the general elevation of the practical arts. It has always labored under the disadvantage of ill-adapted buildings, however, until at last the government has nobly come to its aid by making provision for the immediate erection of a magnificent edifice at a cost of 1,000,000 florins. The plans were prepared after much time spent by the architect in the examination of similar structures, and is believed to embrace the best features of all. It stands in the immediate vicinity of the great art galleries of Munich, and, at the time of my visit to the institution, was already nearly half completed.

The government appropriation to the school for some years has been about $15,000 per annum.

At present the institution comprises simply a school of mathematics and a school of architecture and engineering.

The mathematical school embraces three very complete courses, beginning with analytical geometry and the school of architecture and engineering, two thorough professional courses, so organized that the pupils who enter the mathematical department and complete the several courses there, are enabled to pass directly, and with economy of time, into the professional department.

Students pay a fee, in the first school, of 12 florins; and for each course in the professional school, 6 florins; for use of chemical laboratory, 4 florins 30 kreuzer.

The number of students in May, 1867, was 300; number of professors and other teachers, 19.

It is the purpose, on the completion of the new edifice, to give the school a further expansion in order to meet the wants of other technical professions, and at the earliest day possible to give it a place in the

front rank of the most extensive and progressive polytechnic schools in Europe.

The school at Augsburg is also in a flourishing condition.

POLYTECHNIC SCHOOL OF HANOVER.

The polytechnic school of Hanover is also an extensive and highly flourishing institution. It was founded by government in 1831, which appropriated, in aid of its support, $12,000 annually until 1837, and then erected for its use the present magnificent edifice, one of the finest and most extensive public buildings in the kingdom. Nor did the liberality of the government stop there; for since that date the sum of $24,600 has been annually appropriated from the royal treasury to enable the institution to furnish instruction at moderate rates, and so multiply its benefits.

In common with most institutions of its class, this school includes a preparatory department for mathematical studies, which in this case occupies two years, and is divided into what are known as the preparatory school and the high school.

The preparatory school includes the lower mathematics with the first elements of the analytical branches; also botany, zoology, mineralogy and drawing.

The high school of mathematics, beginning with differential calculus, and including descriptive geometry, practical geometry, and mechanics, in their various departments, qualifies the student to knock for admission at the door of either one of the following professional courses:

1. Course for the technical chemist, two years.
2. Course for the agriculturist, two years.
3. Course for the geometer, one year.
4. Course for machinists.
5. Course for architects, three years.
6. Course for river, road, and railway engineers, three years.

The instruction is given by the director and 24 other able professors and teachers, with the aid of superior facilities in the way of extensive cabinets, museums, laboratories, and a library of 18,000 volumes.

In the school of mathematics, pupils pay a tuition fee of about $20 per annum; in the polytechnic school proper, $8 to $20, according to the number of studies. The cost to the student of living is estimated by the director at $400 to $600, including everything.

The amount realized from fees of pupils averages nearly $10,000 per annum. There were in attendance upon this institution, last year, 466 pupils, gathered from all parts of Europe, and including 14 from America.

SAXONY.

The Royal Industrial School of Saxony is no other than a polytechnic school, and as such deserves mention under this head. It embraces three sections; one for students who wish to prepare for agricultural

pursuits, one for those who expect to devote themselves chiefly to the chemical arts, and a third for pupils preparing for trades in which complicated machinery is a prominent feature.

The term of study for pupils belonging to the agricultural and the chemical sections is three years; for the third, four years.

The course of instruction throughout the first, and during a part of the second year, is common to all three; including German language, arithmetic, geometry, natural philosophy, natural history, chemistry, architectural drawing.

From this point forward, until the close of the third year, except that all are still required to study German and architectural drawing, the courses of study vary for the three sections according to the ulterior purposes of the students in each.

The agricultural pupils are instructed especially in the subject of soils and manures, agricultural chemistry, the culture of plants, cattle-breeding, machinery and mechanical technology, agricultural mechanics, agricultural architecture, and general farm management. The teachers explain to them the modes of practice, in the field and garden, and occasionally take them to places, more or less remote, on agricultural excursions.

The students in the chemical section, meanwhile, and to the end of their course, devote themselves to general and technical chemistry, mineralogy, geognosy, and mechanical technology.

The mechanical section is occupied during the same period with the doctrine of projection, practical geometry, drawing, practical exercises in surveying, mathematical analysis, special trigonometry, analytical geometry, mechanics, descriptive geometry, and drawing of machines; and, subsequently, (during the fourth year,) with the study of machines, drawing of machines, perspective drawing, the higher mathematics, mineralogy, and geognosy, and with theoretical and analytical chemistry. If the pupils have time to devote to them, they are also instructed in commercial bookkeeping and correspondence and in the English and French languages.

The instruction is given by eighteen competent and zealous professors and teachers, who, besides the training they give to their pupils, frequently avail themselves of the opportunities afforded by the many mechanical shops and chemical works of the busy industrial town of Chemnitz for giving them a practical insight into the various branches of industry theoretically taught in the school.

There are also connected with this institution two schools of trades for journeymen carpenters, masons, machine builders, &c., attended by fifty to one hundred pupils each, who receive instruction (chiefly theoretical, since they are already somewhat familiar with the practice of their several trades) in the German language, arithmetic, geometry, mechanics, and physics, natural philosophy, mechanical technology, general architecture, mechanical drawing, perspective, model drawing, and modeling.

After what has already been said of practical education in Saxony, it is needless to add that the school above reported is only a representative of a large number of institutions looking to the same practical end.

SWITZERLAND.

The Federal Polytechnic School of Switzerland, at Zurich, was founded in 1854, by the government. It is a natural and yet very remarkable outgrowth of the excellent system of public instruction in Switzerland—itself the product of the intellectual force and freedom of the people of that mountain republic. The government and people had long desired the permanent establishment of two leading national institutions of learning—a university, for the highest general culture, and a polytechnic school that would contribute to assure the material prosperity and the steady industrial development of the whole country. For a time the struggle among the cantons for the location of the new institutions delayed the realization of this noble purpose. But at length that difficulty was conquered and both the university and the polytechnic school were wisely planted together at Zurich.

A fear lest this branch of my general subject occupy more than its due share of space occasions hesitation in giving a somewhat detailed account of still another of the great polytechnic schools of Europe; and yet the rank to which this institution is entitled, as in some respects the superior of all others of its class, together with the fact that, so far as I am aware, no account of it has hitherto appeared in any American publication, appears to warrant it.

The superior control of the school is vested in the Swiss Federal Council. The more immediate control is intrusted to a council of its appointment, known as the council of the school. The executive officer of the school, known as director, is selected from among all the professors by the council of the school. He is appointed for only two years, but is re-eligible. The professors, also, are appointed by this council. Each particular department of the school is under the immediate direction of a principal; the whole number of the principals constituting the staff of the director.

The institution, as a whole, comprises—

1. The preparatory school of mathematics.
2. The school of architecture.
3. The school of engineering.
4. The school of mechanics.
5. The school of chemistry.
6. The school of forestry.
7. The school for professional teachers.
8. The school of general philosophy and political science.

1. PREPARATORY SCHOOL OF MATHEMATICS.—The term of study in the preparatory school is one year. The course embraces the following subjects, to wit: Algebra and analysis of algebra; geometry of space;

plane and spherical trigonometry; analytical geometry of plane surfaces; elementary mechanics; applications of geometry; experimental physics; chemistry; French language; German language; industrial design. Recitations and examinations in both German and French.

During the summer, pupils designing to devote especial attention to the natural sciences have the opportunity of following a preparatory course in mineralogy and botany.

2. SCHOOL OF ARCHITECTURE.—The instruction given in the school of architecture occupies three years, and embraces the following studies:

First year's course. Differential and integral calculus; preparation of plans for stone-cutting, (lectures and exercises;) descriptive geometry; perspective; chemical technology of building materials; principles involved in the construction of machines; drawing of machines; compositions and exercises; history of architecture of the Middle Ages and modern times; petrography; ornamental drawing; landscape drawing; modeling; experimental chemistry.

Second year's course. Principles of architecture; comparative architecture; exercises in composition; masonry and carpentry; principles involved in architectural constructions; exercises in architectural constructions; shadows and perspective; mechanics; water and road constructions; arch-building; figure drawing; petrography; civil rights, as applied to architecture.

Third year's course. Principles of architecture; exercises in composition; exercises in architectural constructions; architectural drawing; masonry and carpentry, with exercises; ornamental drawing; technical geology; history of art; civil and administrative rights.

3. CIVIL ENGINEERING.—The instruction given in the school of civil engineering occupies three years, and includes the following courses:

First year's course. Differential and integral calculus, (repetitions, the scholars in groups;) analytical geometry, (with daily repetitions, the scholars in three groups;) preparation of plans for cutting of stone, (lectures and exercises;) geometry of position; descriptive geometry, with exercises; technical mechanics, (with repetitions, the scholars in three groups;) chemical technology of building materials; principles involved in the construction of machines; exercises in machine construction; machine drawing; technology and description of the parts of machinery; experimental chemistry; petrography.

Second year's course. Differential and integral calculus, with repetitions; technical physics, with repetitions; graphic statics; various applications of the most important portions of integral calculus; practical hydraulics; technical mechanics; astronomy, (first part, with exercises, pupils in groups;) petrography; experimental physics; topography; geodesy; design; surveying; masonry and carpentry; wood and brick constructions; road-building, and construction of railways and bridges; hydraulic constructions; astronomical exercises at the observatory; perspective; chart-drawing; administrative rights.

Third year's course. Canal and river constructions; geodesy; astronomy, with exercises at the observatory; exercises in construction; iron, brick, road, and railway constructions, (second part;) chart-drawing; administrative rights.

4. SCHOOL OF INDUSTRIAL MECHANICS.—The instruction furnished in the school of industrial mechanics also occupies three years, and embraces the following studies:

First year's course. Differential and integral calculus; recitations and repetition by pupils, (the scholars in groups;) descriptive geometry, exercises and repetitions; analytical geometry, with repetitions; machine drawing; industrial physics; technical chemistry of building materials, with repetitions.

Second year's course. Differential and integral calculus, (second part,) with repetitions; technical physics, with repetitions; technical mechanics, with repetitions, (the scholars in groups;) construction of machines; principles of machine construction, (first part;) mechanical technology.

Third year's course. Principles of machinery, locomotives and marine engines; analytical mechanics; technology of machines, establishment of machines; civil constructions, with exercises; metallurgy; construction of iron bridges and railways.

5. SCHOOL OF CHEMISTRY.—This school includes two courses, one for pharmaceutists and one for industrial chemists, and embraces the following branches:

First year's industrial course. Inorganic chemistry; organic chemistry; analytical chemistry; practical exercises in analysis; metallurgy; chemical technology of building materials; technology and description of machines.

Second year's industrial course. Crystallography; mineralogy; chemical analysis; geology; general, agricultural, and industrial botany; zoology; experimental chemistry; technical drawing.

One year and a half's course in pharmaceutical chemistry. Experimental inorganic chemistry; organic chemistry; analytical chemistry; practical exercises in analysis; manufacture of chemical products; metallurgy; exercises in chemical technology; pharmaceutical chemistry; experimental physics; mineralogy; geology; general, special, and pharmaceutical botany; zoology; pharmacology.

6. SCHOOL OF FORESTRY.—Instruction in the school of forestry continues for two years, at least. The following are the annual courses of study:

First year's course. Forest mathematics, and the customs of foresters; principles of general botany; topography; plain drawing; field measurement; encyclopedia of the science of forestry; excursions, practical operations in the forest, and exercises in the principles of valuation; petrography; agricultural chemistry; rights of the forester.

Second year's course. Management of forests; forest statistics; art of directing forest exploitations; culture and preservation of forests; cos-

mography; topography; excursions into the forest, and practice in the valuation of lands and timber; exercises in relative valuations; design of plans; surveying; construction of roads and hydraulic works; forest entomology; petrography; forest rights under the law.

7. NORMAL SCHOOL.—In the normal school the term of study is at least two years for pupils designing to teach the physical sciences, and not less than three years for those designing to teach the mathematical sciences. The following are the courses of instruction in the two sections:

First year's course in scientific section. Selections of the important portions of inorganic chemistry; practical analysis; experimental chemistry, with repetitions; experimental physics, with repetitions; mineralogy, with recitations and repetitions; zoology, with repetitions; general botany.

Second year's course in scientific section. Principles of crystallography; general geology; manufacture of chemical products; practical analysis; physiology of plants; culture of plants, and treatment of diseased plants; exercises in microscopy.

First year's course in mathematical section. Theory of numbers; differential and integral calculus; theory of functions, with repetitions; analytical geometry of the plane; experimental physics, with repetitions; experimental chemistry, with repetitions; descriptive geometry, with exercises and repetitions; synthetic geometry; machine-drawing.

Second year's course in mathematical section. Differential and integral calculus, (second part;) theory of numbers, (second course;) technical mechanics; astronomy, (first part;) synthetic geometry, with repetitions; shadows and perspective.

Third year's course in mathematical section. Important selections from the theory of partial differential equations; theory of numbers; analytical mechanics; principles of mechanism; astronomy, (second part,) with exercises in the observatory; physical surveys; art of teaching mathematics.

8. SCHOOL OF GENERAL PHILOSOPHY.—The instruction in the school of general philosophy is designed for such advanced students of mathematics, the natural and physical sciences, language, literature, and philosophy, as may desire to avail themselves of the opportunities afforded by both the university and the polytechnic school for a higher proficiency in these several departments of learning. While sufficiently flexible to accommodate the somewhat varied needs of different students, the course of study includes the following branches, to wit:

a. Natural science group.—Experimental physics; magnetism, electricity, optics, with recitals and repetitions; theories of heat; crystallography; organic chemistry, with exercises; experimental inorganic chemistry; analytic chemistry; geology of Switzerland; special botany, botany of officinal plants, with excursions; vegetable physiology; diseases of cultivated plants; exercises in microscopy; electro-dynamics and electro-magnetism; recitations in inorganic and organic chemistry;

physical geography, considered in relation to practical questions; theory and practice of photography.

b. Mathematical group.—Synthetic geometry; treatment of geometric problems; selected portions of differential and integral calculus; exercises in integral calculus; exercises in technical mechanics; stoichometry, and gasometric calculations; geometry of the plane; exercises in constructions based on plane geometry; select analyses in integral calculus; agricultural machines; elements of astronomy and mathematical geography, with demonstrations.

c. Language and literature.—Modern German literature, and its relation to other European literature; Italian comedy; the artistic writings of the period of Leonardo; exercises in language; English language; Shakespeare; lectures upon and exercises in French language and literature; superior exercises in composition.

d. History and political philosophy.—Political science; financial economy; lectures and disputations on national economy; history of the Reformation; history of America, from the discovery to the present time; history of mediæval and modern art; explanations of the sculptures found in archæological museums; constitution of Switzerland; applications of political economy—freedom of industry and commerce; elementary course in statistics; commercial law; history of Swiss art; history of geography; the Russian, Ottoman, and Eastern empires, considered with reference to the national economy; history of Switzerland as the Helvetian Republic.

e. Fine-arts group.—Exercises in modeling ornaments, &c., and in carving in stone; ornamental drawing; landscape drawing and painting in water-colors; figure-drawing.

The instruction in the schools above recited, and which together constitute the Federal Polytechnic School, is given by a corps of sixty-two professors and teachers, with the use of the following auxiliaries: an extensive library, adapted to the wants of the school; a collection of impressions, &c., of figures and architectural ornaments in plaster, serving as models in the different branches of design; a collection of representative specimens of building material, with select models for various constructions; an assortment of surveying and geodetical instruments; an assortment of utensils and materials for illustration in technological mechanics; a collection of models and materials used in technological chemistry and pharmacy; a collection of objects, models, and tools used in forestry; collections illustrative of zoology, botany, mineralogy, geology, and paleontology—one of the largest and best arranged in Europe; an archæological museum; a laboratory for exercises in modeling in earth and in plaster; a workshop for working in wood; a workshop for the construction of machines chiefly metallic; a laboratory for chemical analysis; a laboratory for industrial chemistry and pharmaceutic manipulations; a physical laboratory and cabinet; an observatory; a botanic garden; the forests, collections, and libraries, access to which

is furnished by the canton and city of Zurich, conformably to existing agreements with the federal government.

As in other like institutions, the students are of two classes—regular pupils and auditors, or such as attend partial courses or devote themselves to individual branches. The first named can only be admitted at the commencement of the year, (October 15,) exceptions being made for grave reasons.

The certificates of age, (at least seventeen years,) of good moral character, &c., demanded of regulars, are of the usual kind. The educational qualifications are determined by examination, unless satisfactory credentials from institutions of high character are presented.

Auditors are submitted to the same tests of qualification as regular pupils, except they present certificates showing that they have completed technical courses of study of high grade elsewhere, or are men of ripe age, proposing to extend their theoretical knowledge in certain branches of their profession. They are admitted to the libraries, laboratories, &c., on the same terms as other students.

The fees demanded are 5 francs for matriculation, 100 francs per annum for tuition, and a small sum for the use of libraries, laboratories, &c. By paying a moderate fixed amount each pupil is entitled, in case of sickness, to a separate room and gratuitous treatment in the cantonal hospital for the period of six weeks. The average amount demanded by licensed private teachers (*agrégés, Privat-docenten*) averages about 5 francs for one weekly lesson per half-year. Students distinguished for ability and application, who are unable to pay the fees, are gratuitously furnished with all the advantages the institution can afford.

In order to awaken emulation, to encourage scientific labor, and to recompense the application of students, there is opened each year a competition (*concours*) upon a given subject—the first time for three, the second for four divisions of the school, and the third time for all. A first and a second prize are awarded to the two best memoirs presented at these competitions, a sum for this purpose being set apart each year by the school. To meet the expenses incurred by the competitors for material, &c., used in their researches, a credit of 500 francs, payable to the successful competitors, is granted by the council. These competitive trials remain open eighteen months after their declaration, and the prizes are formally distributed on commencement day, the names of the successful competitors being also published in the Federal Bulletin.

No student is permitted to pass from one division of a school into a higher until after having passed a satisfactory examination in the lower. If unable to do this, he is allowed to continue in the same one year more, after which he must rise into the next class or quit the school.

The diploma of the institution is intended to distinguish high merit, and will in no case be accorded to pupils whose capacity and knowledge of branches pursued, as determined by thorough and rigid examinations, are not incontestably above medium. The diploma fee is 50 francs, and

the degrees confer the title of architect, engineer, mechanical engineer, chemist, pharmaceutist, forester, teacher in the mathematical and physical sciences, according to the course of instruction pursued.

The number of students attending the school during the winter semester of 1866–'67 was 548, of whom 93 were in the preparatory school of science and mathematics, 142 in the school of engineers, 152 in the technico-mechanical school, 69 in the school of chemistry, 21 in the school of forestry, and 29 in the normal school. Enumerated by countries, 234 were from the several cantons of Switzerland; 149 from seventeen of the German states; 129 from the other European states, from Italy on the south to Finland on the north; 2 from Asia; 12 from North and South America. Subsequently, at the date of my visit, the number had reached to nearly 700.

In concluding this general account, I feel myself warranted in awarding a special tribute of high praise to an institution which, though among the most recently organized, nevertheless, for the variety, range, and flexibility of its courses of study, the number of its able instructors, the extent, magnificence, and adaptedness of its buildings, and the number, variety, and completeness of its auxiliaries, even thus early in its career stands foremost of its kind in the world.

ITALY.

Polytechnic education in Italy has received but little development. A strong tendency in that direction is indicated, however, by the recent establishment—mainly since 1860—of numerous elementary technical schools (*scuole tecniche*) in all parts of the kingdom; of several institutions of higher grade, known as technical institutes; and, just recently, of a polytechnic school at the capital.

The instruction in the technical school is limited to about the following branches, the scheme of studies varying somewhat: Italian language; mathematics, (arithmetic, algebra, and geometry;) writing and keeping of accounts; natural science, geography, and history; physical chemistry; linear and ornamental design; French language; gymnastics; rights and duties of the citizen.

The controlling officers are a director, vice-director, and spiritual director, (*direttore spirituale.*) The teachers have the rank and title of professor.

In 1865 the number of these establishments was 177; number of pupils, 8,831. In 1866 the number of such schools had increased to 205.

Of technical institutes there were, in 1865, 59, employing 510 professors and teachers, and giving instruction to 4,337 pupils; 25 of the schools had valuable libraries, with a total of 57,281 volumes, and 37 of them were provided with mathematical instruments, having the value of $144,636; 33 of the schools belong to the government, 5 to the provinces, and 16 to the communes. The 33 government schools had, in 1865, a revenue of $200,059, of which $72,000 was furnished by the state.

The course of instruction in them varies considerably, according to circumstances; but, for the sake of illustrating their character as technical schools, I present an outline programme of the studies in the Superior Technical Institute, at Milan, premising with the statement that it ranks somewhat above the majority of the schools bearing the same general title.

Branches taught: mechanics, theoretical and applied; physical technology; agriculture and rural economy; geology and mineralogy, with practical applications; industrial mechanics and construction of machines; geodesy; topography and topographical design; applications of descriptive geometry to the art of design; construction of roads and railways; river and agricultural hydraulics, hydraulic constructions, and aqueducts; jurisprudence of agriculture, and the elements of administrative law; measurement of velocities, (*celerimisura;*) architecture; industrial chemistry, with exercises in the laboratory; botany; perspective; the art of ornamentation; elements of figure.

The instruction in the above branches of study is given by twelve regular professors, assisted by seven professors connected with other institutions, who either deliver lectures on the branches taught in the institute or give instruction in the laboratories.

At Florence there is a technical school of like general character, and sometimes called polytechnic, in which scientific instruction is given by some of the most eminent scientific men of Italy. And at Turin, Naples, and Ferrara there are professional schools of engineering, &c., in which the instruction given entitles them at least to honorable mention under the general head of polytechnic schools, especially as they are alive to the importance of the earliest possible expansion into schools of wider range and higher rank.

A country that has given to the world the mariner's compass, the telescope, the galvanic battery, the Voltaic pile, and the discovery of this grand new hemisphere, and in whose men of genius still burns—and burns with a stronger flame, being fanned anew by liberty—the fire of a noble ambition to further contribute to the progress of mankind, will be a leader and not always follow in the wake of the New Civilization.

SCANDINAVIAN STATES.

The polytechnic schools of the Scandinavian states are few and of recent establishment, the only ones of which I have knowledge being the Danish school at Copenhagen and the Swedish school at Stockholm. Of both of these I am also able to speak in high terms, from personal knowledge gained by recent inspection, and only regret that the space to which it seems proper to limit this portion of my report will not admit of more than a very brief reference to each of them.

The Polytechnic School at Copenhagen is connected with the Royal University, as one of its schools, by virtue of which arrangement it derives much advantage from the courses of instruction given by that

institution in the departments of mathematics, the natural and physical sciences, language, political economy, &c., as well as from the collections, chemical laboratory, and extensive library with which the university is so well provided. A new, large, and handsome building, for the better accommodation of its valuable geological and other collections in natural history, as well as the extension of its laboratories, shows the estimate in which it is held by the government, and the spirit with which its development is being pushed by those who have its interests in charge.

The Royal Technological Institute at Stockholm was founded by the government in 1858, since which date it has been furnished with very commodious and costly buildings, with furnished laboratories and much valuable machinery for the mechanical division, and also favored with an annual appropriation of 55,000 rixdollars, (about $14,600.)

The school year begins September 1. Applicants for admission are required to be sixteen years of age at least, and to have a good knowledge of the Swedish language, of geography, and of Swedish and general history, a mastery of general arithmetic, algebra, plane geometry, trigonometry, and an acquaintance with the first principles of physics and inorganic chemistry.

The full term of study is three years, and the course of study embraces the following general branches of study: analytical geometry; differential and integral calculus; practical geometry, applied to land, road, and river surveys; descriptive geometry; theoretical mechanics; applied mechanics; mechanical technology; general physics; chemistry and chemical technology; work in the laboratory; mineralogy and geognosy; general engineering; drawing and coloring.

The instruction is given by the director of the institute and fifteen other professors and teachers; number of pupils in 1867, 86.

The success of this institution will doubtless lead to the early establishment of others of the same class.

RUSSIA.

Technical education in Russia is widespread and rapidly advancing, though at present chiefly confined to schools of the primary and secondary class, the number of which is very great.

Among those that specially require notice, the most important is the Technological Institute of St. Petersburg. At its origin this institution was designed for the training of boys in the mathematical and scientific branches taught in real-schools, together with professional exercises. But in 1861 it was entirely reorganized and put upon the higher polytechnic basis; so that it now ranks among the most successful and most useful of the technical institutions of Europe.

Applicants for admission must have attained the age of sixteen years and have already received such secondary education as is furnished in a college or lyceum.

The course comprises four years, being divided into theoretical and

practical, with two distinct professional faculties, the faculty of the chemical sciences and the faculty of the mechanic arts.

The number of students in 1867 was 600, of whom 80 were aided by the state, and 50 of whom were gratuitously supported—the rest paying $24 per annum for theoretical instruction and $30 for practical training in the workshops and laboratories.

In the way of material facilities the institution is well provided, having large workshops well equipped with tools and machinery, laboratories for applied chemistry, a factory for products obtained by the decomposition of wood by distillation, a distillery, a dyeing establishment, a gas-factory, and a museum of models of the latest improvements of every mechanical sort deemed desirable for introduction from foreign countries, as well as such models of superior quality as are executed by the pupils themselves.

The Russian government is also establishing schools of this character in other parts of the empire, and it is understood that the movement has received a new impetus from the demonstrations made in this department by so many of the progressive nations at the Exposition.

WURTEMBERG.

The Royal Polytechnic School of Wurtemberg, at Stuttgart, organized in 1862, has thus soon acquired a very honorable position among institutions of its class. It includes a professional school of architecture, a school of engineering, a school for machinists, a school of technical chemistry—each comprising three years' courses; and a school of pharmacy, embracing two courses of one year each.

The number of professors and other teachers is 42, and, notwithstanding embarrassment is now felt, owing to the non-completion of new structures designed for its use, it numbers 300 to 400 students, and bids fair to rival ere long its flourishing neighbor at Carlsruhe. New buildings are just being completed at a cost of nearly 1,000,000 florins.

POLYTECHNIC SCHOOLS OF OTHER EUROPEAN STATES.

Other continental polytechnic schools are found in several of the European countries; as in Holland, where, within the past three years, a school has been founded at Delft, and is now receiving aid from the state to the amount of $37,700 per annum; in Belgium, in which country there are several schools of this type, though not bearing the usual name; in Westphalia and some of the other smaller German states; and in Spain and Portugal. But at present the schools of these countries are more limited in their sphere of influence than those of which an account is given above, and, so far as they relate to the purpose of this report, only serve to show how almost universally on the European Continent does the sentiment already prevail that a wider and more generous diffusion of a knowledge of the sciences, and of their applications to the practical arts, is essential to the progress of civilization.

GREAT BRITAIN.

Scientific and polytechnic education in Great Britain, for reasons which might be made to appear but which are not necessary to the objects of this report, has had comparatively less development within the past few years than on the continent. But even there very much has been accomplished. The keen criticism of many of the real statesmen of the United Kingdom upon the British system of education and upon the character of their leading institutions of learning, and their warning that, unless more attention be given to applications of science and of technical art, the glory of British supremacy in the leading branches of manufacture must pass to other countries—these have not been without results.

Polytechnic schools, distinctively so called, have not multiplied. But, under the form of schools of the arts; schools and academies of design; mechanics' institutes, museums, with halls in which lectures are given on various branches of applied science; universities for the working classes, such as the Andersonian University at Glasgow, in which workingmen and others have the advantage of regular courses of lectures on the sciences, and in the other departments of learning, by able men; learned and industrial societies, with fully organized systems of instruction by lectures and discussions, like those of London, Manchester, Dublin, Glasgow, and Edinburgh—under all these various forms do we find the work of polytechnic schools more or less efficiently performed. Nor can this be the end of development in the direction of scientific education in Great Britain. The Exposition of 1867 has added yet more than its predecessors to the argument of necessity, and her far-seeing statesmen and distinguished cultivators of science, thus strongly re-enforced, will be enabled to accomplish more within the next ten years than in any two decades before.

UNITED STATES.

Polytechnic schools in the United States, if the enumeration be limited to such as are distinctively so called, will number but three, to wit, the Massachusetts Institute of Technology at Boston, the Rensselaer Polytechnic Institute at Troy, New York, and the Polytechnic College of the State of Pennsylvania at Philadelphia. A brief notice of the first of these must represent the whole class in this connection.

The Massachusetts Institute of Technology, organized in 1862, and then and since endowed to the extent of nearly half a million dollars, embraces within its plan: 1. A school of industrial sciences. 2. A museum of arts. 3. A society of arts.

The objects of the institute, as set forth, are:

1. To provide a full course of scientific studies and practical exercises for students seeking to qualify themselves for the professions of the mechanical engineer, civil engineer, practical chemist, engineer of mines, and builder and architect.

2. To furnish a general education founded upon the mathematical, physical, and natural sciences, English and other modern languages, and mental and political science.

3. To provide courses of evening instruction in the main branches of knowledge above referred to for persons of either sex, who are unable to devote themselves to study during the day, but who desire to avail themselves of systematic evening lessons and lectures.

Candidates for admission to the school must have attained the age of sixteen, and are examined in arithmetic, plane geometry, elementary algebra, and such other English branches as are ordinarily taught in a high school or academy.

The regular courses of study extend through four years. Students may enter in advanced classes, but must, in such cases, have the same qualifications as to age, &c., as if they had entered at the beginning and reached the class or division where admitted in due order of study.

In the first two years the instruction is general, and common to all classes of students preparing for the technical courses, embracing, in general terms, the following branches:

First year. Algebra; solid geometry; plane trigonometry and its applications; mechanical drawing, and the commencement of descriptive geometry; free-hand drawing; elementary mechanics; chemistry, with manipulations; English language and literature, and French or German.

Second year. Continuation of same studies into the higher mathematics, with descriptive astronomy, surveying, and experimental physics.

The courses in the third and fourth year are technical, embracing the necessary continuations of the mathematical and other scientific studies, with their applications to the various scientific professions above enumerated.

At the completion of the respective courses special diplomas are conferred upon all who pass the required examinations.

The institute is already well provided with the means of illustration, demonstration, chemical analysis, &c., and is constantly increasing them.

But the three polytechnic schools first above enumerated by no means constitute the list of really polytechnic schools in the United States. The colleges of agriculture and the mechanic arts endowed by the congressional act of 1862, and already established in Brown University, at Providence; in the Sheffield Scientific School of Yale College, at New Haven; in Dartmouth College, at Hanover, New Hampshire; in the State University of Vermont, at Burlington; in the Cornell University, at Ithaca, New York; the Maryland Agricultural College, near Washington City; the Massachusetts College of Agriculture; the Illinois Industrial University; the College of Arts of the University of Wisconsin; the Iowa State Agricultural College, (and College of the Mechanic Arts,) in Story County; the College of Agriculture and the Mechanic Arts of Kansas; and the State Agricultural and Mechanical College of the University of Kentucky, at Lexington—all these institu-

tions have an actual existence, some of them with histories of a dozen successful years, and may be treated as the beginnings of so many polytechnic schools, while the State Agricultural, Mining, and Mechanical Arts College of California is about organizing, and twenty more similar schools are destined to be established at an early day in all the remaining States.

CHAPTER X.

SCHOOLS OF MEDICINE, LAW, AND THEOLOGY.

I.—Schools of medicine—The earliest schools—Italian schools—French medical schools—Schools in Austria and Prussia—Medical education in Great Britain—Brazil—Medical education in the United States—II. Schools of law—The earliest schools—Schools of the Latin nations—Italy—French, Spanish, and Portuguese schools—Brazilian schools—Schools of the Germanic nations—Scandinavian schools—Russian, Anglo-Saxon, British, and American schools—III. Schools of theology—The first Christian schools—Tabular view of schools of theology in Europe—Schools in France, Italy, German States, and other portions of Europe—Schools of theology considered as a class—Comparative courses of instruction.

I.—MEDICAL SCHOOLS.

Dealing, as it does, with the spiritual, no less than with the physical, laws and relations of man, it is not surprising either that medicine should have been one of the first and most honored of the professions, or that its development should have waited during those successive periods of centuries whose beginnings were marked by the shining names of medical history, as also by the founding of the great schools of Alexandria, of the Roman empire, and of modern Europe, for those signal discoveries of chemistry and microscopy which have at length furnished the foundations of a true medical science.

Untold centuries of dogmatism, then full two thousand years of empiricism, then at last the dawn of science—this has been the order of development. What a shortening of this long period there might have been had the Alexandrian school not been blotted out so soon after entering the pathway of systematic investigation, we can only conjecture; though it seems highly probably that the careful dissections of the human body there instituted, had they continued until they became common at the other great centers of science and philosophy, would have saved the world from at least a thousand years of slavery to the anatomical and physiological crudities of Hippocrates, Galen, and Avicenna—an assumption warranted not more by the known learning and spirit of investigation that reigned in those days at Alexandria than by the unmistakable evidences we find in Celsus's great work, *De Medicina*, of the actual benefits derived by the ancient world from the discoveries made by the Alexandrian anatomists, notwithstanding the destruction, by Saracenic vandals, of all their written works.

But immediately following this period came the closing twilight, evening, and midnight of the Middle Ages, during which, except among the Arabians, who gave it refuge and fostering care, the only home of medical science was at Salernum, whose school, though great from the

eighth to the thirteenth century, and the only one in the world—at least the only one worthy of mention—was really but a taper-light in the midst of the thick darkness that enveloped all Europe besides.

At this school there were no anatomical dissections and no important investigations of any sort, its object being merely to give to its pupils a knowledge of the long-established authorities. Instruction was given by lectures, and the candidates for authority to practice were obliged to undergo an examination on the aphoristic teachings of Hippocrates, the therapeutics of Galen, the materia medica of Dioscorides, and the first book of Avicenna; to take an oath, pledging themselves to purity of life, obedience to the laws, gratuitous attendance upon the poor, and non-participation in the profits of the druggist. After successfully passing this ordeal, they were required to pass at least one year under the superintendence and direction of physicians of experience and acknowledged character, before attempting to practice on their own responsibility.

At length, with the Renaissance, the establishment of the great universities of France, Italy, Germany, Austria, and England, and the revival of investigation as a means, and the only means of positive knowledge, sprung up those great schools of medicine whose history embodies a record of almost every important step in the progress of medical science, and which are to-day, as they have been for more than five hundred years, the chief sources of light and of medical authority for all nations.

ITALY.

Just when Italy began the establishment of schools of medicine in the universities that date back to the twelfth, thirteenth, and fourteenth centuries, it is now hardly possible to say; but there seems good reason for assuming that at Bologna and Naples they were coeval with the universities there established, and that Italy was therefore first in the period of the Renaissance, as well as foremost in the former period of decline, to found institutions of this class.

For many generations the names of those cities, as well as of Padua and others, have been inseparably connected with the history of discovery and progress in medical science; and although the fountains there open more than five centuries ago are less frequented by the eager thousands who thronged the vast amphitheaters of those early times from all parts of Europe, these same universities are still medical centers and annually attract large numbers of Italian students to their halls.

At the present moment each of the twenty universities has its *facoltà di medicina e chirurgia*, except Urbino; which, however, in common with a majority of them, has its courses in veterinary medicine and in pharmacy, and even adds special courses in obstetrics and in blood-letting, (*corso di flebotomia.*)

The regulations for admission to the *facoltà* are of universal application,

and the same is likewise true of such state *regolamenti* as determine the course of instruction and the conditions of graduation.

The applicant for admission must present a certificate, showing that he has completed the studies of the lyceum, which are, in general, Greek and Latin literature, Italian literature, history and geography, philosophy, physics, chemistry, mathematics, natural history, mechanics, and gymnastics, and undergo an examination upon geometry, trigonometry, algebra, the elements of natural history, and Italian and Latin literature. The term of study is six years; the fees 280 lire (of about 19 cents each) for the entire course, or 46.66 lire for each year.

The distribution of studies in the several years of the course is substantially as follows:

First year. Botany; physics; inorganic chemistry; zoology and comparative anatomy; human anatomy; exercises in anatomical dissections and normal histology; botanical exercises, especially upon medicinal plants.

Second year. Physics; physiology; organic and physiological chemistry; human anatomy; exercises in chemistry, especially physiological chemistry, and in anatomical dissections.

Third year. Physiology; general pathology; exercises in physiology and in pathological histology.

Fourth year. Special medical pathology; special surgical pathology; materica medica and experimental therapeutics; hygiene; topographical anatomy; exercises in pathological and topographical anatomy; attendance upon the medical and surgical clinics.

Fifth year. Clinical medicine and clinical illustrations from the chair; clinical surgery with illustrations and discussions on the theory and practice of medicine; obstetrics and doctrine of the diseases of women and children; obstetrical clinics; ophthalmic diseases and ophthalmic clinics; pathological anatomy; exercises in pathological and topographical anatomy, and surgical operations upon the cadave.

Sixth year. Medical clinics and illustrations as in fifth year; surgical clinics and discussions upon the practice of medicine, with clinical illustrations, as in fifth year; special study of diseases of the skin for four months; special study of syphilitic diseases for four months; special study of mental diseases for four months; medical jurisprudence and toxicology; exercises in pathological anatomy and in legal medicine and toxicology.

Besides these several faculties of medicine and surgery in the universities, there are some special and independent schools of superior rank, such as the Royal College of Medicine and Surgery at Naples, the Medical College of Florence, and the Medical and Surgical School of the Royal Institute of Superior Practical Studies and "*Perfectionment*," at Florence.

The organization of the Royal College at Naples is peculiar, in that provision is made for the boarding and lodging of two hundred students

in the institution—the maximum number of day students (*esterni*) being determined by the administrative commission of the college—and in the division of the whole body of students into four classes named for the particular portions of the general course of study, to wit: 1. Physical students. 2. Ante-practical students. 3. Practical students. 4. Surgical students.

The course in the college is more strictly professional in its earlier portions than that in the first year of the university faculties already described; but the students are obliged to attend the courses in physics, chemistry, botany, zoology, comparative anatomy, human anatomy and physiology, with the appropriate exercises, in the Royal University. Each *circondario* (division of the province) is entitled to a half-scholarship. The attendance at this institution is large, and its career seems to be in all respects successful.

The course of study in the medical and surgical section of the Royal Superior Institute at Florence is exclusively practical; being designed for such as, having laid the foundations of professional study at the schools of the faculties and other medical institutions, desire to complete their professional studies at the capital, where unusual facilities are furnished for the study of various classes of disease in the hospitals, as well as for instruction in some of the less generally taught applications of science.

There are also secondary schools of pharmacy and minor surgery, and of theoretical and practical obstetrics, at Aquili, Bari, Lucca, Catanzaro, and Milan.

As before remarked, nearly every medical school has, connected with it, a complete and independent course in pharmacy, (*corso chimico-farmaceutico*,) for the benefit of such as desire to engage in that subordinate branch of the profession. The term of study essential to the right to practice and the diploma of *farmacista* (apothecary or pharmaceutist) is four years; the studies of the course being, for the—

First year. Inorganic chemistry; botany; and mineralogy.

Second year. Organic chemistry; botany; pharmaceutical chemistry; natural history of medicaments; practical exercises in pharmaceutical chemistry and qualitative analysis.

Third year. Materia medica and toxicology; pharmaceutical chemistry; natural history of medicaments; practical exercises, as in the second year.

Fourth year. Practice for the whole year at a pharmacy in some public hospital, civil or military, or with a private pharmaceutist authorized by the minister of public instruction.

The price of tuition for the whole course is 152 lire. Admission is granted upon the presentation of evidence that the applicant has completed the studies prescribed for the *ginnasi*, (gymnasia of the kingdom,) as well as the three years' course in a *scuóla tecnica*, and upon passing a satisfactory examination, written and oral, in the Italian language, in Latin grammar, in the lower branches of mathematics, and in physics.

Of the numerous schools of veterinary medicine connected with the faculties in the universities at Naples, Bologna, Turin, Milan, and many other university cities, some account has already been given in a previous chapter.

Whether considered in reference to the number of the schools of high rank, the completeness of their courses of instruction, the great extent and value of many of the collections illustrative of anatomy—human, comparative, and pathological—of materia medica, and the other branches of medical study, or in reference to the distinguished ability and genius of many of their medical professors, Italy may fairly claim a leading place in the world of medical science. And yet, it is nevertheless true, that even here she shows unmistakable traces of that restraining, cramping, and repressing influence so long imposed by her political and religious institutions upon the intellectual energies of the people. With the spirit of progress lately awakened, it is reasonable to anticipate an advancement in this profession—already, with jurisprudence, in the lead in that country—corresponding to the marked taste and genius always manifested for it by the Italian mind.

FRANCE.

French medical science and medical schools may be said to have had nearly, if not quite, simultaneous origin with Italian; the first school—medical faculty of the University of Paris—dating back to the year 1274. And although the French mind has always been characterized by a special fondness and genius for mathematical studies, its tendencies toward, and its success in, the study of all those natural sciences which underlie the comprehensive science of medicine have been scarcely less remarkable. It is not surprising, therefore, that so many of the prominent names of medical history belong to France. She has earned the high position she holds in this profession by trampling under foot every form of pretense and quackery and making thorough work, both by the systems of instruction instituted and the regulations adopted for insuring capacity and scientific qualifications on the part of those who enter the profession.

There, as well as in Italy, the medical schools are under the direction of the minister of public instruction; the ordinary faculties and schools, I mean, there being special schools of medicine and surgery for the military and naval services, respectively. The faculties are three in number—located at Paris, Montpellier, and Strasbourg—with a total of 61 professorships. Besides which, there are three superior schools of pharmacy, with 19 professorships, established at the same places, in connection with their medical faculties; and, in the larger cities in the different departments, over twenty preparatory schools, (*écoles préparatoires de médecine et de pharmacie,*) with 10 to 12 professors each.

The three superior schools are alone competent to confer the title of doctor; the diploma of the *écoles préparatoires* being that of health offi-

cer, (*officier de santé.*) In order to obtain the degree of doctor, which alone secures the privilege of full practice in medicine and surgery anywhere in the empire, it is necessary to have followed the courses of instruction in one of the great faculties during four full years, or the courses in an *école préparatoire* during three and a half years, and at least one annual course in a faculty of medicine; to have spent two years in a hospital near the faculty or preparatory school; to undergo three annual examinations, and five at the end of the studies, and to present a satisfactory thesis. The fees amount, in the aggregate, to 1,260 francs. But this account only shows the way out of the French schools when once entered by the ambitious student. In order to gain admission the applicant must, at the time of inscription, show his diploma as bachelor of letters, and, even then, he is not permitted to take the third annual course of lectures unless able, by that time, to present the diploma of bachelor of sciences *restreint*, that is, with limitations—in this case, only on the side of mathematics.

It is owing to this superiority of preparation in the departments of letters and science that the term of study is limited to four years in France, instead of six, the period in Italy, where, it will be remembered, the student is permitted to enter with the *licenza liceale*, and is, therefore, required to spend a large proportion of his time during the first two years in studying the physical and natural sciences; after which period of two years, the studies of the French and Italian courses are quite the same.

For example, the *faculté de médecine*, at Paris, comprises the following departments, to wit: Anatomy; pathological anatomy; physiology; medical physics; hygiene; materia medica and therapeutics; medical chemistry; medical natural history; histology; surgical pathology, (two professors;) medical pathology, (two professors;) pathology and general therapeutics; operations and apparatus; surgical clinics, (four professors;) obstetrical clinics; medical clinics, (two professors and two substitutes;) accouchements, and diseases of women and children; legal medicine; and pharmacology.

Besides these twenty-five professors, there are honorary professors, who deliver occasional lectures to examiners (*agrégés*) charged with courses complementary of the clinics embracing diseases of children, and ophthalmia, and twenty-five *agrégés* in the discharge of their ordinary functions.

The diploma of *officier de santé*, which entitles the holder to practice anywhere in the department where certificated, but limits him in surgery to the minor operations, except it be in the presence and with the consent of a doctor, is obtained at the end of three years' study in a faculty, or three and a half years in a preparatory school, with two years' practice in a hospital, five regular examinations, and an acceptable thesis. Twenty-one years is the minimum age.

The conditions for admission to the courses of study having this

diploma in view are, sixteen years of age past, and a *certificat d'examen de grammaire*—a certificate indicating about the proficiency in Latin, Greek, some living language other than French, mathematics, history, &c., required of pupils who pass from the fourth year of the *lycées*. The fees for the full course, examinations, and diploma are 840 francs in the faculties, and 780 in the *écoles préparatoires*.

Such is the provision made by France for the preparation of physicians and surgeons for ordinary practice. They certainly show an intelligent appreciation of the great importance of thoroughness of qualification on the part of those to whom the care of the public health is intrusted, and it is no wonder, therefore, that there, too, as in Italy, the law severely punishes those who attempt the functions of the medical profession without the authority of the schools.

But yet further provision is made by strict regulations for the apothecaries who deal out the medicines prescribed; making it penal for them to do so without being possessed of a *diplôme de pharmacien*. This diploma is of the first and second grade; the first being good anywhere in France; the second anywhere in the department of the empire chosen by the pharmaceutist on receiving it. Both classes of the diploma may be obtained in either of the three superior schools of pharmacy above referred to, and the diploma of second grade may be obtained at one of the preparatory schools of medicine and pharmacy without attending a superior school.

For a first-class diploma, the aspirant must first have been provided with the diploma of *bachelier ès sciences;* and subsequently have completed three full years of study in a superior school of pharmacy, or two and a half years in a preparatory school and one year in a superior school; have spent, since he was sixteen years of age, three years in a legally established pharmacy; have undergone five semi-annual examinations and three final examinations upon chemistry, physics, toxicology, pharmacy, botany, zoology, mineralogy, and medical natural history; and have attained the age of twenty-five. The total of the fees amounts to 1,390 francs.

The *diplôme de pharmacien* of second grade is conditioned on the primary possession of the *certificat d'examen de grammaire;* the completion of one year's course of study in a superior school, or one year and a half in a preparatory school; six years' practice in an authorized pharmacy, outside the term of study; and five satisfactory examinations, the last three on chemistry, physics, and toxicology, and at the minimum age of twenty-five years. The cost of this diploma, all told, is 660 francs.

Diplomas are also provided for gatherers, preservers, and preparers of medicinal plants. These are also of two grades; the first obtainable only at a superior school of pharmacy, and good throughout France; the second at a preparatory school, and good only in the department for which received. Women are eligible to these diplomas. Neither age, nor period, nor place of study is a requisite condition; but the

candidate must pass an examination bearing upon the knowledge of medicinal plants, the precautions necessary to their gathering, their drying, and their preparation for the druggist. The cost of examinations and of the *diplôme d'herboriste* is 80 francs.

A *diplôme de sage-femme* is provided for women of capacity and reproachless lives, between the ages of eighteen and thirty-five, who establish, before a faculty of medicine, in a preparatory school, such knowledge, scientific and practical—the practical knowledge having been acquired at a lying-in hospital—in relation to accouchements, as renders them competent accoucheurs in ordinary cases, or attendants upon the sick in such cases as are in charge of regular physicians.

But the army and navy demand certain important special qualifications on the part of physicians and surgeons who would practice therein; and, accordingly, the government of France has established, and placed under the control of the minister of war and the minister of marine and of colonies, schools of medicine and of pharmacy, especially designed to meet that want.

The imperial schools of military medicine, and pharmacy are two in number—a preparatory school, located at Paris, in connection with the superior schools of medicine and of pharmacy, and a school of application, at Paris, in connection with the military hospital of Val-de-Grâce. The preparatory school, *École Impériale du Service de Santé Militaire*, provides a four-years' course of study in medicine and a three-years' course in pharmacy, and leads to the school of application. Admission is possible only to such as have succeeded at a competitive examination instituted by order of the minister of war, and are able to present the two diplomas of bachelor of letters and bachelor of science limited, or the diploma of bachelor of science, according as the candidate proposes to prepare for the medical or the pharmaceutical service; evidence of being between the ages of seventeen and twenty; a certificate of capacity for active military service; and an engagement to serve in the health department or the pharmaceutical service of the army for ten years. This done, the candidate is examined in a manner designated by the minister, and, if passed, enters the school not only as a pupil of medicine or of pharmacy, as the case may be, but as a member of the family of the institution; paying 1,000 francs per annum for board, and a certain sum, fixed each year, for clothing. Tuition, examinations, and the diploma are free stipends, and half-stipends are provided for such worthy pupils as are without the means to pay for their boarding and wardrobe.

The School of Application, *École Impériale d'Application de Médecine et de Pharmacie*, at Paris, was designed to initiate the graduated pupils of the preparatory school and such doctors of medicine as are found qualified to enter the school, in the special exercise of the medical and pharmaceutical arts in the army, to complete their practical education, and to familiarize them with the regulations which govern the army in their

relations to the health-service. Doctors of medicine and pharmaceutists who would enter this school must show that they are natives or naturalized Frenchmen; that they are under twenty-eight years of age; that they have bodily capacity for the active military service; and must engage to continue in the service five years and undergo two examinations to prove their superior qualifications—the first, a public competitive examination, in the place where opened by the minister, from time to time, as the needs of the service demand; and the second, a special examination by the officers of the school, upon anatomy, medical pathology, and therapeutics, and upon practical surgery, if doctors; and upon the natural history of medicaments, materia medica, chemistry, and pharmacy, if pharmaceutists. No provision is made in this school for the boarding and lodging of students; but tuition and all else is free; and besides, during their stay at the school—which continues until they are called into actual service—each student receives pay at 2,160 francs per annum and an indemnity of 500 francs for clothing. After having been in the school one year they are examined, and if found qualified for service, they receive the brevet of *médecine aide-major* of the second class, or of *pharmacien aide-major* of the second class.

The imperial schools of naval medicine and pharmacy are three in number, located at Brest, Toulon, and Rochefort, in connection with the great marine hospitals at those places. The instruction is permanent and gratuitous, and all the libraries, botanical gardens, anatomical amphitheaters, &c., are freely open to the students. The conditions of admission are quite the same as for the military school last mentioned, except that the minimum and maximum ages are eighteen and twenty-three years respectively.

From this glance at the magnificent system of medical instruction in France, let us turn to some of the Germanic countries and see what they are doing in this department.

AUSTRIA.

The Austrian system of medical schools is worthy of a place side by side with that of France; for though cast in a somewhat different mold, in all essential respects the general features are the same. The leading schools are found in connection with the universities at Vienna, Prague, Gratz, Innsbruck, Olmutz, Lemberg, and Cracow. There are also schools at Klausenburg and Salzburg, besides schools of pharmacy and veterinary science and special obstetrical academies in considerable number.

To attempt the practice of medicine, surgery, obstetrics, or pharmacy without the evidence of educational fitness is a penal offense.

The certificate of the gymnasium (*Abiturienten-examen*) is a *sine qua non* of admission to any of the medical schools, and a four years' course of study, confined almost exclusively to branches strictly speaking profes-

sional, is requisite to admission to the final examinations necessary to be passed by all candidates for the doctorate.

The greatest school of medicine in Austria, and, in some respects, the greatest in Europe, is the *medicinisch-chirurgische Facultät* of the Royal University in Vienna. I shall be pardoned, therefore, for occupying the principal portion of the space assigned to medical education in Austria with a general account of the condition in which I found it in 1867.

The whole period of study is divided into ten semi-annual courses; the general departments of study, and the order of them, as recommended to students, (the order is not obligatory,) being as follows:

First semester. Zoology; mineralogy; chemistry; descriptive anatomy; anatomical exercises; anatomy of plants; lectures on zootomy.

Second semester. Plant-morphology and systematic botany; chemistry; descriptive anatomy; lectures on medicinal plants, preparatory to the study of pharmacognosy.

Third semester. Dissections; topographical anatomy; physiology; general pathology; pharmacognosy; prescriptions; instruments and bandages.

Fourth semester. Topographical anatomy; physiology; pharmacology; prescriptions; surgical apparatus and use of bandages; preliminary study of climatology; percussion and auscultation.

Fifth semester. Pathological anatomy, with practical dissections; theory of surgical operations; surgical clinic; medical clinic; medical jurisprudence and legal dissections; courses on pathological anatomy and physiological and pathological chemistry.

Sixth semester. Pathological anatomy, with dissections; science of operative surgery; surgical clinic; medical clinic.

Seventh semester. Medical clinic; medical jurisprudence and exercises in legal dissections; clinic for ambulant patients, and clinic for diseases of the eye; instruction in vaccination; obstetrical clinic.

Eighth semester. Surgical clinic; medical clinic; obstetrical clinic.

Ninth semester. Surgical clinic; medical clinic; descriptive anatomy; practice in dissecting; topographical anatomy; physiology.

Tenth semester. *Ambulatoreum*, and clinic for diseases of the eye; descriptive anatomy; topographical anatomy; physiology.

The instruction in the several departments of study is given by 35 full professors, 19 assistant professors, and 39 *Privat-docenten;* all of whom give numerous lectures and demonstrative exercises during each semester. To convey some idea of the range and amount of instruction by this the largest corps of medical teachers connected with any single institution of the kind in the world, I present a complete list of courses in which lectures and demonstrations were given during the winter semester of 1867, together with the number of hours per week devoted to each:

TITLES OF COURSES BY FULL PROFESSORS.—Medical hodegetics, five hours each week; descriptive anatomy, five hours; topographical anat-

omy of the neck and trunk, four hours; comparative anatomy of the vertebrate animals, one hour; dissections, five hours; descriptive anatomy, (the viscera,) three hours; comparative physiology, five hours; physiology and higher anatomy, five hours; practical histology, five hours; pharmacognosy, three hours; general pathology, five hours; general therapeutics, two hours; toxicology, three hours; general pathological anatomy, five hours; pathological dissections, three hours; pathologico-anatomical diagnostics, with demonstrations, three hours; special medical pathology, therapeutics, and clinic, five hours each, by two professors; surgical clinic, with lectures upon special surgical pathology and therapeutics, five hours each, by two professors, and three hours by a third; surgical operations, three hours each, by two professors; orthopedy, five hours; operations on the bladder and generative organs, two hours; theoretical and practical instruction in diseases of the eye, two hours daily; special pathology and therapeutics of eye diseases, with clinic, two hours daily; theoretical and practical instruction in operations upon the eye, and in the proper use of eye-glasses, five hours; clinical lectures on the special pathology and therapeutics of eye diseases, five hours; surgical instruments and the dressing of wounds, two hours by one professor and three hours by a second; dental instruments and dental operations, in four to six weekly courses; legal medicine and practical exercises in legal dissections, seven hours; resuscitation of persons seemingly dead, and rescue from sudden accidents, two hours; obstetrical clinic, and theoretico-practical instruction in obstetrics, five hours; gynecological clinic, with lectures upon the female sexual organs, five hours; obstetrical operations, with demonstrations, one hour; theoretical obstetrics, one hour; history of medicine and epidemiology, four hours; clinic for diseases of the skin, five hours; diseases of the skin, five hours; clinic for syphilitic diseases, in eight weekly courses; theoretical lectures on the diagnosis and management of syphilis in general, five hours; clinical lectures on special pathology of the diseases of children, five hours.

By extraordinary professors and Privat-docenten: The theory of human malformations, two hours; course on eye-glasses, five hours; anomalous refractions and disturbed movements (*Mobilitätsstörungen*) of the eyes, six hours; dioptrics of the eyes, with introductory lessons on physical optics, three hours; systematic instruction in the treatment of the eyes, four hours; diagnosis of diseases of the eye, two hours; operative obstetrics and gynecology, five hours each, by two lecturers; diseases of the skin, two hours each, by two lecturers, and five hours by a third; diseases of the skin, and syphilis, with demonstrations, five hours; syphilis, together with differential diagnosis of syphilitic and non-syphilitic diseases of the skin, illustrated by cases, two hours; polyclinical lectures upon diseases of children, five hours; diseases of infants, particularly of newly born infants and sucklings, three hours for six weeks by one lecturer, and three hours by a second; theoretical and practical lectures

upon special medical pathology and therapeutics, five hours; medical climatology, four hours for two months; auscultation and percussion, five hours; percussion and auscultation, with the diagnosis of lung and heart diseases, five hours; pathology and therapeutics of diseases of the head, two hours; laryngoscopy and rhinoscopy, as well as diseases of the head, the throat, and the windpipe, three hours by one lecturer, and five hours by another; operative dentistry, two hours; operative dental surgery, with clinical demonstrations, three hours; clinical lectures on practical psychiatry, three hours; theoretical and practical psychiatry, three hours; theory and treatment of insanity, two hours by one lecturer, and three hours by another; practical discussion of diseases of the ear, five hours for five weeks by one lecturer, and five hours for five weeks by a second; electrotherapy, five hours in six weeks, and four weeks' courses, by two lecturers; homœopathic clinics, six hours; hydrotherapeutics, with practical demonstrations in the imperial baths, five hours in four-weeks' courses; healing waters in general, with special reference to the physiological and therapeutical value of Austrian mineral springs, two hours; treatment of chronic diseases of women with mineral water, three hours; clinical propædeutics, (practical course,) three hours; theoretical propædeutics, two hours; diagnostic exercises by the sick-bed, pathology and therapeutics of the central and peripheral nervous systems, five hours; lectures and demonstrations upon the structure and connection of the brain and back, in their relation to the falling sickness, six hours for six weeks; physiological and pathological chemistry and microscopy, five hours for six weeks, and three hours during remainder of semester; practical exercises and demonstrations in physiological and pathological chemistry and microscopy, qualitative and quantitative analysis, and animal chemistry, six hours; practical instruction in vaccination, two hours.

Here we have a grand array of nearly a hundred courses of lectures and practical exercises running through the whole, or a considerable portion, of the half-year, and comprising, in the aggregate, not less than nine thousand lessons of one hour each in every branch of medicine, and nearly every disease within the range of medical practice; and this is but one of the ten semesters through which the student is to pass on his way to the doctorate, the only door of entrance to the medical profession.

But even this is not the total of the facilities afforded by this magnificent institution. The collections, museums, libraries, laboratories, botanical gardens, &c., constitute a no less remarkable array of material aids; while the general hospital, with its numerous divisions for all the important classes of disease, its thousands of beds, and superior facilities for a dozen or more distinct clinics, on a large scale, surpasses all other hospitals in the world.

Owing to the liberal support of the government, and the large number of stipends derived by the university from some seventy-five special foundations, in which this faculty has a share, tuition in some depart-

ments is entirely gratuitous, and in others so moderate as to be but a slight burden upon the student of even slender resources. The fees for the optional courses, by the thirty-nine or more able and learned *Privat-docenten*, range between $3 and $6 per semester. Admission to all departments of the hospital is free to all matriculated students. The fees required of the candidate for the doctorate, for examinations, diplomas, &c., are 180 florins, (of about 50 cents each;) of the candidate for admission to surgical practice, (already of necessity a doctor,) 100 florins. Special diplomas are granted in dentistry, pharmacy, obstetrics, veterinary science, &c., conferring, for the most part, the title of master. The number of medical students in attendance upon this faculty, in 1867, was over 900; of whom 91 were graduated in medicine, 50 in surgery, and 55 in pharmacy.

With so strong and brilliant a light as this great institution blazing at the imperial capital, it may be inferred that no portion of Austria is left to grope in total medical darkness.

PRUSSIA.

Medical education in Prussia rests so nearly upon the same basis as in Austria, that I shall omit all details concerning it. Of course, Berlin is the great center; but there are also important faculties in the universities at Halle, Königsberg, Greifswald, Breslau, Gottingen, and Bonn. The conditions of admission to the faculties and to the practice are quite identical with those of Austria.

The *medicinisch-chirurgische Facultät* of the Royal Frederick-William's University, at Berlin, has made rapid growth within the past quarter of a century; and even now, in the number of its learned and distinguished teachers, ranks with the school at Vienna. It is also provided with extensive facilities in the way of collections, laboratories, and hospitals. There are, at present, 98 doctors giving the instruction there furnished; of whom 33 are full professors, 26 extraordinary professors, and 39 *Privat-docenten*. An enumeration of the courses of lectures given by this army of professors and teachers during the winter semester of 1867 will be found in the chapter on universities further on.

OTHER CONTINENTAL COUNTRIES.

Other continental countries likewise afford interesting illustrations of the importance attached by the most enlightened governments to the applications of science to the healing art; but a special account of their schools is deemed unimportant, after the somewhat lengthy notice already given of the institutions belonging to the four nations which have the lead in this profession.

From personal observations I am able to speak in high terms of the faculties of Saxony, Saxe-Weimar, Bavaria, Wurtemberg, Baden, Belgium, Netherlands, Denmark, Sweden, and Russia. I was particularly impressed at Munich with the extent and great value of the facilities

afforded by the physiological institute, the laboratory for physiological chemistry, and the pharmaceutical institute for the study of those fundamental and auxiliary branches of medical science; as also at St. Petersburg, with the superior advantages for clinical instruction offered by the extensive array of hospitals of various kinds located in the medical quarter of that imperial city.

GREAT BRITAIN.

Great Britain, though, until within the present decade, seriously deficient in the matter of a uniform system governing medical education in the kingdom, and still at fault, as it has seemed to me, and is acknowledged even by English critics, in the incompleteness of the foundation for scientific pharmacy, is nevertheless fully entitled to a place high on the roll of honor. Early among the nations to establish schools, and always somewhat exacting in her demands upon the professors, England has not failed of furnishing a fair proportion of the discoveries and scientific works that have contributed to make medicine as useful and honorable as it is old in time and necessary to mankind. To have given but two such names as Harvey and Jenner to the catalogue of discoverers and benefactors of the race, would have alone commanded the benedictions of civilized nations in all subsequent ages; but, not content with these, she has added others, and yet others, to the list of distinguished physicians, surgeons, and authors, until the pages accorded to her by the medical historian are luminous with great names.

One or two of the British schools date back to the sixteenth century, but a majority have had their origin since the year 1800. The number of such as are recognized by the highest professional authorities is 36—considerably larger than in either France or Italy, and probably twice as large as in any of the other European countries: 23 of these recognized schools are English, 13 of them being located at London, and the others at the following provincial towns, to wit: at Birmingham, 2; and at Bristol, Hull, Leeds, Liverpool, Manchester, Newcastle-upon-Tyne, Sheffield, and York, 1 each; 4 of the 36 are Scotch, located, 1 at Edinburgh, 1 at Glasgow, and 2 at Aberdeen; and the remaining 9 are Irish, being established, 6 at Dublin, 1 at Cork, 1 at Belfast, and 1 at Galway.

Besides the foregoing, there are the nominal schools in connection with Oxford and Cambridge Universities, the Military Medical School at Netley, the medical department of Anderson's University at Glasgow, and a considerable number of hospitals in which more or less complete courses of instruction are given, though not enough to warrant such scientific bodies as the Royal College of Surgeons of England in allowing them to certificate candidates for admission to examinations for membership. There is also at London the School of Pharmacy and the Royal School of Veterinary Surgery. Adding all these to the others, and we have a total for the United Kingdom of some 50 medical schools.

Nor does this complete the enumeration of medical educational institutions and agencies. For among the most important of them all are certain incorporated bodies known as universities, colleges, societies, and halls, which, though no courses of instruction may be given within their walls, are nevertheless authorized to examine students who have studied elsewhere, and grant such certificates, licences, and degrees as they may adjudge them entitled to.

Belonging to this general class, there are for England the University of London, the Royal College of Physicians, the Royal College of Surgeons of England, and the Society of Apothecaries, all located at London; for Scotland, the Royal College of Physicians and the Royal College of Surgeons, at Edinburgh; the University of St. Andrews, and the Faculty of Physicians and Surgeons of Glasgow; and for Ireland, the Queen's University in Ireland, the King and Queen's College of Physicians in Ireland, the Royal College of Surgeons in Ireland, and the Apothecaries' Hall of Ireland, all located at Dublin.

The schools proper are divisible into such as grant degrees, and such as only give certificates of study. To the first belong the university schools in general; to the latter, hospital schools and most of the independent schools. The second class stand, therefore, in a relation somewhat like that of grammar schools to the degree-conferring institutions. They agree in giving instruction in the essential branches of medicine, namely: anatomy—general, descriptive, morbid, surgical, and comparative; botany; chemistry—general, medical, and practical; physiology; materia medica and therapeutics; principles and practice of medicine; principles and practice of surgery; obstetrics and the diseases of women and children; medical jurisprudence. To which some add courses in forensic medicine; experimental philosophy; histology; dental surgery, &c., one or several, as circumstances allow.

This second class of schools also agree in having a winter session and a summer session, which together occupy the entire year; in expecting students to follow the courses of study at least three years; and in charging, as fees for lectures, demonstrations, and hospital practice, £25 to £35 per annum, or £75 to £105 for unlimited study. Located either in direct connection with or in close proximity to large hospitals or infirmaries, they all afford excellent opportunities for practical study; while the considerable number of their professors—ranging from twelve to twenty—would seem to insure a fair degree of thoroughness in the instruction given. In many of the schools there are a few free or partly free scholarships, for the benefit of sons of professional men, or of gentlemen in a corresponding station in society, of reduced circumstances, together with various prizes in medals and money for superior proficiency in some department of study, or for highly meritorious reports, essays, &c.

The courses of instruction in the institutions having power to confer degrees differ from those in the foregoing only in that they extend

through a period of four years, and, in general, are given by a class of more eminent men, each confined to one individual branch named in the curriculum of study.

The degrees conferred in Great Britain are those of bachelor of medicine, (M. B.,) master in surgery, (C. M.,) and doctor of medicine, (M. D.) No one is admitted, as a rule, to the course of medical study in a university who has not either graduated in the arts, or is able to pass an examination in the elements of mathematics, the English and Latin languages, and in at least two of the following branches, to wit: Greek, French, German, higher mathematics, natural philosophy, logic, and moral philosophy. And in no case is a candidate for the professional examinations prerequisite to the degree of bachelor of medicine, or the degree of master in surgery, eligible to such examinations unless possessed of the general educational qualifications above named. Each candidate is also required to establish by certificates—

1. That he has been engaged in medical and surgical study for four years—the medical session of each year comprising at least two courses of not less than one hundred lectures each, or one such course and two courses of not less than fifty lectures each, (except clinical courses, in which the lectures must have been as many as two a week during the prescribed periods.)

2. That he has studied, during courses of not less than one hundred lectures, the following departments of medical science, to wit: Anatomy; chemistry; materia medica; institutes of medicine; practice of medicine; surgery; obstetrics, and diseases of women and children; two courses of obstetrics of three months each, or one course of six months; general pathology, or, in schools where no such course exists, a three months' course on morbid anatomy, with a supplemental course in practical medicine or clinical medicine; a six months' course in practical anatomy; practical chemistry, three months; practical obstetrics, three months, at a recognized lying-in hospital, or certificate from a registered physician of attendance on six cases of labor; clinical medicine and clinical surgery during courses of six months, or two courses of three months; medical jurisprudence, botany, and zoology during courses of not less than fifty lectures each.

3. That, for at least two years, he has attended the medical and surgical practice of a general hospital with not fewer than eighty patients, and with a distinct staff of physicians and surgeons.

4. That he has attended for at least six months, as an apprentice or otherwise, the outside practice of a hospital, or the practice of a dispensary, physician, surgeon, or member of the London or Dublin Society of Apothecaries.

5. That one of the aforesaid four years of study has been in the medical school of the university to which application for examination is made. Some institutions (University of Edinburgh, *e. g.*) also require that another of the four years of study shall have been either in the said university or in some other university authorized to grant degrees.

6. That he has, at date of application, completed his twenty-first year.

7. That he is, or at date of application will be, under no articles of apprenticeship to any surgeon, physician, or other master.

Thus qualified, the candidate may be received to examinations, both written and oral, first, on the elementary branches of medical science, such as anatomy, chemistry, botany, and materia medica; second, on advanced anatomy, zoology, comparative anatomy, physiology, and surgery; third, on materia medica and the strictly practical departments, including practical medicine, clinical medicine, clinical surgery, obstetrics, general pathology, and medical jurisprudence. A thesis on some medical subject is also required.

The examinations in the natural history branches and in practical chemistry are conducted, as far as possible, by actual demonstrations upon material placed before the candidates, and the examinations in the practical departments are conducted, at least in part, in the hospitals; candidates being required to test their knowledge by examinations and prescriptions. As a general rule, those whose study is in the university are examined in the branches of the first and second divisions above enumerated at the close of the second and third years of their course; but admission to examination on those embraced in the third or practical division cannot take place until the candidate has completed his fourth year. Should the candidate fail, he cannot be admitted again until the completion of another year, or the expiration of such period as the examiners may prescribe.

The degree of master in surgery can in no case be conferred upon a candidate who is not at the same time granted, or has previously received, the degree of bachelor of medicine. The ordinary examination and diploma fees are about £5 for each of the three divisions of the examination; in all £15 for the degree of bachelor of medicine. If the candidate should desire the degree of master in surgery, a further fee of £5 is required.

The degree of doctor of medicine is conferred upon candidates who have obtained the degree of bachelor; have spent, since their graduation, at least two years in attendance upon a recognized hospital, or in the military or naval medical service, or in medical and surgical practice; and are either possessed of the diploma of bachelor of arts from a recognized university, or have passed, either before their examination for the bachelor's degree, or at the time of said examination, or within three years thereafter, a satisfactory examination in Greek, in logic, and moral philosophy, and in at least one of the following subjects, to wit: French, German, higher mathematics, natural philosophy, and natural history.

The several learned and scientific bodies already enumerated under the titles of colleges of physicians and colleges of surgeons do not grant degrees proper, but they have authority to examine candidates and grant licenses on very nearly the terms and conditions above recited

as requisite for the degree of bachelor of medicine and master in surgery. The recipient is known as licentiate and is entitled to the general privileges of bachelors.

These colleges of physicians and surgeons have also at their disposal memberships and fellowships, which are only conferred upon persons of advanced attainments in medicine and surgery. Some of them also have authority to grant certificates of qualification in dental surgery and other special departments of practice.

The societies of apothecaries of London are bodies similarly constituted, with authority to grant certificates of qualification to practice as apothecaries; which, in Great Britain, means a very different thing from apothecary practice in America; for the British apothecary is not a mere dealer in drugs, as a merchant deals in goods, but a general practitioner.

Every candidate for the apothecaries' certificate must produce evidence—1. Of having passed a preliminary examination in arts, equivalent at least to the matriculation examination of the University of London, or the middle-class examinations of Oxford and Cambridge. 2. Of having served an apprenticeship or pupilage of not less than five years to a qualified practitioner. 3. Of having attained the age of twenty-one years. 4. Of good moral character; and 5. Of having pursued a course of medical study in conformity with the court of examiners; which, at present, embraces three full years of two sessions each, and includes the general branches of medical science taught in the medical schools, especial attention being also given to practical chemistry, forensic medicine, and toxicology.

Previous to 1858 great embarrassment was experienced by the profession in Great Britain, owing to the diversity of qualifications demanded by the different licensing and degree-conferring bodies and schools in different portions of the kingdom, as well as by the existence of numerous practitioners whose scientific preparation was inadequate to the grave responsibilities assumed. But an act of Parliament of that date, entitled "The medical act," and since improved by successive amendments, laid a broad foundation upon which there is now being built up the very complete and harmonious system of medical education imperfectly outlined above.

So long as there was no compelling power it was vain that the schools established their courses of instruction and invited all who would enter the profession to qualify themselves by thorough scientific study for their difficult and responsible duties. A few, prompted by just sentiments, would gladly avail themselves of the opportunities thus offered; but the many, so long as allowed to practice without qualifications, acquired only by the expenditure of time and money, would turn away from the proffer of science and satisfy themselves with the lowest grade of qualifications that would be tolerated by the public at large, so utterly incompetent to judge of relative degrees of fitness.

The medical act referred to regulates this whole interest by providing,

1. That every person, whatever his condition, rank, or title, who would practice in any department of the medical profession, shall be registered as such practitioner with the legal authority of his district.

2. That no person shall be entitled to recover any charge, in any court of law, for any medical advice or attendance, or for the performance of any operation, or for any medicine which he shall have both prescribed and supplied, unless he shall prove upon trial that he is registered under said act; and that no certificate of legal character given by non-registered practitioners shall be received.

3. That no person may be registered who is not certificated, licensed, or graduated by one of the legally authorized societies or collegiate bodies named in the act, and on the basis of qualifications I have already recited.

4. By placing it in the power of certain councils to determine the faithfulness with which the authorized schools and other corporations fulfill their respective offices as educators, examiners, and licensers, and to strike them from the authorized list if they fail to comply with the standard.

The execution of the law is intrusted to a general council of medical education and registration of the United Kingdom, composed of one person from each of the leading universities, colleges of physicians and surgeons, and apothecaries' societies of the kingdom, elected by each of them respectively; and six other members representing the three divisions of the kingdom, and nominated by the Queen, with the advice of the privy council. This general council has the power not only to enforce the law of registration, but to require the medical schools of every grade, issuing licenses or diplomas, to report the courses of instruction, rules of examination, and graduation, &c., from time to time, and, if it should desire to do so, it may send visitors and inspectors to the schools to examine into and report upon the efficiency of their management in the instructional departments. Should the council become satisfied that any given institution is below the proper standard as a qualifying medical school, it is required to report such school to the privy council, with which body rests the power to order a denial of registration to all subsequent graduates or licentiates therefrom until its courses of study and regulations shall have been made to conform with the requirements of the law.

Such, in outline, are the advanced systems of medical education in Europe. If less than perfect, who is to criticise their defects? Certainly no American writer, whatever the ideal he may have set up.

SOUTH AMERICA.

South American medical education is most favorably and very nobly represented by Brazil, which empire is the most advanced of the South American states, and which, as before remarked, was also the only one

of them represented in the educational department of the Paris Exposition.

There are in the empire two medical faculties; one located at the capital, and the other in the province of Bahia. Both are under the same governmental regulations, and both are in a flourishing condition, as reported by the Brazilian Commission, to whose officers I am indebted for the facts here presented.

The course of study extends through a period of six years, and embraces the following subjects: General physics, especially as applicable to medicine; chemistry; mineralogy; descriptive anatomy, with anatomical demonstrations; botany; zoology; organic chemistry; physiology; general anatomy; internal and external pathology; obstetrics and diseases of women and new-born children; topographical anatomy; medical operations; instruments; materia medica; therapeutics; hygiene; history of medicine; medical jurisprudence; pharmacy, with practice in the pharmaceutical laboratory.

There are also special courses for pharmacy and obstetrics respectively, the term of study in which is three years.

Each faculty possesses a chemical laboratory, a cabinet of physics, of natural history, of human and comparative anatomy, and of materia medica; also a surgical arsenal, a pharmaceutical laboratory, and access to large botanical gardens.

The instructional corps consists of 21 professors and 21 assistants, all of whom are appointed by the government after competitive examinations.

Admission to medical study in these faculties is only after an examination in the leading branches of a general education; candidates for a place in the courses strictly medical being examined in Latin, French, English, history and geography, rational and moral philosophy, arithmetic, geometry, and algebra to equations of the first degree; candidates for the study of pharmacy in French, arithmetic, and geometry. The annual and final examinations are rigid, and cover the whole ground of the medical course.

The diplomas conferred are those of apothecary, bachelor of medicine, and doctor of medicine; and no person is allowed to practice either pharmacy or medicine without such evidence of scientific preparation. Even foreign graduates of medical schools, with diplomas *viséed* by the Brazilian consul resident in the country where issued, must pass an examination by one of the imperial faculties before they are permitted to offer themselves for practice, except in the case of acting or retired professors from schools of medicine, recognized by the foreign government or governments, who are exempted from examination on presentation of certificates from the Brazilian diplomatic agents, or consuls residing in the country or countries where they have been professors.

In the faculty of medicine of the capital there were in attendance in 1865, 228 students; 183 in the medical course, and 45 in the pharma-

ceutical course. In the faculty of Bahia, the number inscribed was 173, of whom 151 were following the medical course.

The annual appropriation by the government in aid of the two schools is 211,770,000 reis, ($52,942 50.)

UNITED STATES.

In the United States we number many medical schools, and, first and last, there have stood at the head of them men of learning, genius, and eminent distinction. And so we have, also, in the ranks of the profession many physicians and surgeons of great ability and skill. But hardly any one who is familiar with the status of medical education among us will claim that either the distinguished professor, author, or practitioner has owed his success in any considerable degree either to the training of the schools or the *esprit de corps* of the profession; for the training is, for the most part, little more than a pretense, as compared with actual European or any reasonable ideal standard, and the *esprit de corps* has yet to be created.

A few of the leading institutions prescribe something in the way of general educational qualifications for admission to professional study; and require that the candidate for the degree of doctor of medicine shall have spent three years in the study of medicine, including attendance upon two courses of lectures. The vigorous and progressive University of Michigan, going beyond the others, demands, as a condition of admission, a proper knowledge of the English language and a respectable acquaintance with its literature and with the art of composition; a fair knowledge of the natural sciences and of elementary mathematics, including algebra and geometry; and such a knowledge of Latin as will enable the applicant to read current prescriptions and appreciate the technical language of the natural sciences and of medicine. But most of the schools require nothing whatever in the way of general education, not even the ability to write or speak the English language with tolerable correctness; demand no evidence of a preliminary study of the profession, and are content to let their students bear away the diploma of doctor after two rather brief courses of lectures, and these, not unfrequently, in immediate succession and occupying, both together, less than nine full months.

But even this is not the worst of the case; for a little science is better than no science at all, and a great number of the practitioners now intrusted with the sacred guardianship of the public health never saw the inside of a medical college. In but few of the States is there any regulation demanding professional qualifications of those who assume to practice, and the people are accordingly the victims of the most outrageous and lawless quackery on every hand.

It is because of this deplorable and shameful condition of things in the United States, that I have presented at so great length an account of medical education in five of the leading European countries. The

few words I have said of its condition in this country are not flattering to American pride; but they are true, and ought to be patiently heard with good effect by every friend of his country and kind. If our people and the State and national governments could, for once, fairly get rid of the notion that we are a little in advance of all other nations in every sort of thing, and, when in that mood, look as learners at the wiser action of the governments above noticed, and so profit by their example, there might be an earlier escape from the condition of semi-barbarism in which, in respect of medical education at least, our country yet remains.

II.—SCHOOLS OF LAW.

Though the Roman Empire has lain for centuries in the tomb of departed nations, yet are all the civilized peoples of to-day under Roman rule through Roman law. Other nations had developed systems of law, but none of them possessed that happy combination of genius for organization and government, with that comprehensiveness of grasp, those larger ideas of justice, and that disposition to look on all sides of a question of rights, which could only come of vastness of empire with a consequent necessity for harmonizing many conflicting interests, and which alone could give capacity for the determination of universal principles and the construction of enduring systems of jurisprudence.

But the Romans were not only originators, digesters, and imposers of law; they were also the first systematic teachers of law by means of established schools; the professorships of law in the Auditorium established by Constantine the Great, at Constantinople, in the fourth century, and the law school founded by Theodosius, at Bologna, in the succeeding age, being notable instances of schools of law at that early day. During the darkest period of the night of the next succeeding centuries we hardly know with certainty what was done in such of the schools as remained; but almost the first dawn of the Renaissance in Italy reveals the Bolognese school still at its work, and the learned Irnerius and Gratian teaching the Roman and the canon law under the inspiration of the presence, at the university, of thousands of eager students, gathered from all the countries of Europe.

It is by the Latin nations, moreover, that law is taught and studied with most patience and thoroughness at the present moment. In all of them it has a department in nearly every university, with a course of study in no case less than four and generally five years in duration, and with numerous and able professors.

ITALY.

In Italy, for example, there are twenty-one faculties *di giurisprudenza*, with an average of fifteen full professors, and often several honorary and extraordinary professors, and each with an imperative course of five years requisite to the degree of doctor, and, moreover, with the provision that

no applicant shall be admitted to the courses, even though he should only aim to qualify himself for the licientiate, which requires four years' study, or merely for the office of notary public, unless possessed of the *certificato di licenza*, (equivalent to an American A. B.,) and able to pass an oral and written examination upon Italian and Latin literature, ancient and modern history, and moral philosophy.

The obligatory instruction for the several years of the course is precisely the same in all the faculties, being fixed by imperial decree, to wit:

First year. Introduction to the study of juridical science; history of law; institutes of Roman law; and comparison of the Roman with the law of the country now in force.

Second year. Roman law; institutes of canonical law; civil law and civil code; penal procedure.

Third year. Roman law; the civil code; criminal law and criminal procedure; civil procedure and order of trial.

Fourth year. Civil code; commercial rights; political economy; constitutional law; international rights, public, private, and maritime.

Fifth year. Commercial law; political economy; international rights, public, private, and maritime; philosophy of law; administrative rights; medical jurisprudence.

In addition to this general obligatory course, in many of the faculties there are special courses, by honorary professors, on various subjects for such as have time to attend them; as, for instance, on political geography, social statistics and social science, the codes of other nations, &c. At the conclusion of the first three years of study, such as have mastered all the studies embraced may receive the degree of bachelor in law; at the end of the fourth year, the degree of licentiate; at the end of the fifth year, the diploma of doctor.

As a means of encouraging protracted and thorough study, the government mainly supports the faculty; requiring of students merely the nominal sum of 410 lire, (about $78,) for the entire course of five years, and this payable in five equal installments. With such terms, with the necessity for a degree in order to admission to the courts, and with that fine *esprit de corps* that naturally comes of thorough scholarship in the profession, coupled with the prestige of a former unequaled greatness and glory, it is hardly a wonder that so large a proportion of the ambitious young men of the Italian states who enter the universities devote themselves to the study of the law.

FRANCE.

In France, legal instruction is also under control of the state; the minister of public instruction having it in special charge. Besides the great *faculté de droit* of the Academy of Paris, in which there are six chairs for the Code Napoléon, four chairs for Roman law, a chair of criminal legislation and civil and criminal procedure, a chair of civil procedure, one of criminal law and penal legislation compared, one for the code

of commerce, one of administrative rights, one for the law of nations, one for the history of the Roman and the French law, one for French law, studied in its feudal origin and customs, and one for political economy,—beside this great school, there are ten other faculties connected with as many of the remaining fifteen academies, in different parts of the Empire; each with two professors of Roman law, three of the Code Napoléon, and one or more each for the other essential departments of study. The full term of instruction in all the faculties is four years.

The French degrees in law are the same as in Italy, and the general regulations governing admission, &c., are similar. No person is admitted to the courses prescribed for any degree whatever unless a graduate in the arts. Thus qualified for study, the candidate for the degree of bachelor, which only admits the possessor to a solicitor's practice, must complete the courses of the first two years, and undergo two examinations; the first in the Institutes of Justinian, and the second in the Code Napoléon, the penal code, and the codes of civil procedure and of criminal instruction.

The student who desires the degree of licentiate, the lowest grade of diploma that will admit him to the barrister's or advocate's practice, must first have received the degree of bachelor, have completed the third year's course of study in a faculty of law, have taken four inscriptions, submitted to two examinations—the first in the Code Napoléon, the second upon the codes of commerce and of administrative law—and defended a thesis bearing on questions of Roman and French law.

To obtain the degree of doctor in law, it is necessary to be a licentiate, to take four inscriptions, and to complete the four years' courses of study; to undergo two examinations upon the Roman law, the law of nations, a searching examination upon the French civil law, French law studied in its feudal sources, the history of law, and to sustain a thesis comprising two dissertations—one upon Roman law, the other upon French law. To these two dissertations there must also be joined at least four propositions upon the history and the difficulties of the Roman law; three upon the history and the difficulties of the French civil law; two upon criminal law; and two upon the law of nations or other branches of public law. The degree of doctor is an essential qualification for admission to the competitive examinations which constitute the door of entrance to the honorable position of professor in a faculty of law.

The cost of the bachelor's diploma, including tuition and examinations, is 630 francs; of each of the subsequent higher degrees, 600 francs.

For such persons as design merely to practice in a subordinate capacity, as mere solicitors, notaries public, &c., a *certificate de capacité en droit* is granted at the end of one year's study, embracing the first and second years' courses in the Code Napoléon and the codes of civil and criminal procedure; the expense being but 285 francs.

The Spanish and Portuguese regulations closely resemble those of Italy and France, as likewise do those of the most of the Latin nations of South America.

The faculties of law in Brazil, to which country I have several times already had occasion to refer, in evidence of the high standard of education there established, afford a very interesting illustration of this statement. They are two in number, located at the capitals of the provinces of St. Paulo and Pernambuco. Both are under the same imperial regulations and are largely aided by the state—the annual appropriation amounting to $38,827—in order that the expense of thorough legal education may be no impediment in the way of poor young men of genius.

For the benefit of such persons as may not be able to enter at once upon professional study, a preparatory course has been established in connection with each of the faculties, for instruction in French and English languages and literatures, Latin, arithmetic, geometry, history, rhetoric, and philosophy. The professional course occupies five years, the very full and complete programme comprising lectures and exercises given and directed by eleven professors in each faculty and eleven substitutes; the two degrees conferred are those of bachelor and doctor, the first being attainable after the completion of the third year's course, and conferring the privileges of the magistratic career or of the professional advocate, and the last only at the end of five years, and after an examination on the studies of the entire five years and the defense of a thesis upon each department of law included. No one can be a professor unless possessed of the degree of doctor of law thus acquired, and not then unless the successful contestant in a public competitive examination.

In 1865 the number of students in the preparatory course of these two faculties was 732; in the professional or superior course, 815.

GERMANIC STATES, SCANDINAVIA, RUSSIA.

In the Germanic States, law is also ably and successfully taught in nearly all, if not every one, of the universities. More exactly, the number of faculties of law is 34; the total number of professors, including a score of professors of political economy whose courses are not an essential part of the faculties, being 295. Of these faculties, nine are Prussian, with a total of 83 professors; four are Austrian, with 74 professors; 12 are Bavarian, (three being parts of complete universities, and nine being incomplete courses of political economy and studies preparatory to the profession of law,) with 41 professors; one is Saxon, with 22 professors; one, with nine professors, (besides which there are seven professorships of political economy,) belongs to Wurtemberg; two, with 19 professors, belong to Baden; one, with eight professors, to Hesse Darmstadt; one, with five professors, to Mecklenburg-Schwerin; one, with 11 professors, belongs to Saxe-Weimar; one, with nine professors,

to the Electorate of Hesse; and one, with seven professors, to Holstein.

To these lists of professors, as constituting the instructional corps, it is also necessary to add a larger number of *professores extraordinarii* and *Privat-docenten*, who crowd in great numbers about the faculties, and many of whom are among the ablest lecturers in Germany.

An illustration of the mode in which law is taught in the German faculties will be found in a list of subjects taught during the winter semester of 1867 in the *Rechts- und Staatswissenschaftliche-Facultät* of the great Frederick William's University at Berlin.

The term of study requisite to the degree of doctor—the only one conferred—is four years of two semesters each. The *Maturitäts Zeugniss*, (answering to our degree of A. B.,) granted by the gymnasia of Germany, is requisite for admission, and the student is also expected to attend certain lectures in the faculty of philosophy. The price of tuition in some departments is nothing, the professors being paid by the government; in others it is so much for each course of lectures per semester, averaging about four dollars.

Schools of law in the Scandinavian states are neither numerous nor provided with large corps of professors; though I have found few in which the instructors appeared more able and zealous. Being a little later in origin than those of Germany, they show many marks of the influence of the German examples set them, especially in the general character of their organization; and yet in other respects, for example in the gradation of studies and the degrees conferred, they more nearly resemble the schools of France and Italy.

The instruction is mainly given by lectures, but examinations are more frequent, and exercises similar to the moot-court exercises at the law schools in America are more common; and, instead of one degree, as in Germany, there are three, corresponding almost exactly with those of France and Belgium. Thus, after two years' study, the successful student acquires the title of candidate; after three years, the degree of licentiate is conferred; and after four years, the degree of doctor. None of these are possible without general attainments corresponding in extent to those prescribed for other countries; nor without undergoing several successive examinations, both written and oral.

Two of the Scandinavian schools are Danish, located at Copenhagen and Kiel; one is Norwegian, located at Christiania; and two are Swedish, having connection with the royal universities at Lund and Upsala.

The *Rets- og Statsvidenskabelige-Facultet* of the Copenhagen University has seven full professors and two extraordinaries, giving instruction to about 200 students; the faculty of the University at Kiel, five professors, and 60 students. Price of tuition is $2 50 to $5 50 per course per semester.

The faculty of law of the University at Christiania is similarly organized and is usually attended by over 100 students.

The *Juridiska Facultetet* of the Swedish University, at Lund, includes a professor of administrative law and national economy; a professor of the history of law; a professor of statute law and legal process; and a professor of civil law, Roman law, encyclopedical jurisprudence; and an adjunct professor of administrative and criminal law. The number of students in attendance is usually 120 to 150.

The faculty of the University at Upsala has a corps of seven full professors, and is attended by an average of 250 students. In both these faculties the public lectures are free to all matriculants. The private courses of professors and of *docents* require a fee of $1 50 to $3 per semester.

The Russian law schools are also faculties or departments of the universities, being found in those located at St. Petersburg, Moscow, Kiev, Kharkov, Kasan, and Helsingfors. In matters of organization, they bear a strong resemblance, as before intimated, to the German schools, though the courses are more definitely fixed, owing to the less number of extraordinary professors and *Privat-docenten* included in their corps of instruction. The number of professors proper ranges between four and fifteen; the number of students, between seventy-five and three hundred.

GREAT BRITAIN.

Anglo-Saxon schools of law constitute no exception to the general rule of educational inferiority that applies to this most energetic, practical and materially and politically progressive of all the races. It is true that they are not so far behind and inferior to corresponding schools of the Latin and Germanic races as are many other classes of the schools I have had occasion to notice; but they are, nevertheless, far inferior to what they ought to be.

In Great Britain there are nominal or real law departments in most of the universities, but they are generally very loosely organized and but imperfectly fulfill the office for which they claim to exist. Indeed, I know of no single, thoroughly organized, vigorous, and liberally officered university law school in the United Kingdom; such a school, I mean, as even the most partial friend of British institutions could for a moment, if intelligent, think of comparing with the faculties at Paris, Bologna, Vienna, and Berlin. This may be said of them, however, and more than can be said of our own, namely, that they only confer degrees upon such as have acquired, either prior to or during the period of their law study, a general knowledge of language, literature, and philosophy.

Quite a proportion of the London and provincial practitioners acquire their knowledge of law, and their authority to practice, under the auspices of those anomalous organizations known as the Inns of Court, whose chief virtue is that they keep the student in the atmosphere of the courts long enough, before admission, for him to acquire some knowledge of both principles and practice by absorption. They are, in fact,

mere societies of practitioners and students, possessing, by favor of ancient sovereign grants, extensive buildings, including libraries, public halls and lodgings, living under certain regulations as binding by reason of antiquity as if they were acts of parliament; but yet, in the main, yielding to each member the general prerogative of doing about as he pleases. The fees for admission to these inns of London, of which there have long been four—Inner Temple, Middle Temple, Gray's Inn, and Lincoln's Inn—are £30 to £40; beside which the admitted student must give a bond of £100 for the payment of the price of his meals during the period of his study. No person in trade of any sort, no deacon, and no one who has held the position of conveyancer's clerk can be admitted a member on any account; nor can solicitors and attorneys be admitted until their names have been two years off the rolls. The term of study before any student, unless a bachelor of laws or master of arts of the University of Oxford, Cambridge, or Dublin, may apply to the officers of the inn of which he is a member is five years; at the expiration of which period, if known to have been reasonably diligent and to have conducted himself in a manner becoming the profession, he pays his admission fee of £66 or more, according to the inn to which he belongs, takes the oath, and is recorded a barrister.

UNITED STATES.

In at least one respect the law schools of the United States are superior to those of England, namely: in that what they really assume to do at all they do more thoroughly and well. But it is no less true that they undertake very little in comparison with what is both attempted and accomplished in many of the other countries to which I have referred. In the form of departments, there are schools of law connected with Harvard College, Yale College, the State Universities of Michigan, Wisconsin, Kentucky, Mississippi, and Virginia; Columbia College, Washington University at St. Louis, and possibly with one or two others. Beside these, there is the independent school at Albany. In all these schools of law the term of study is two years, the courses of instruction being so arranged that a complete view is given during each year of the subjects embraced within it. The professors number from one to five in each of the schools; a majority of them, in many instances, being judges of the supreme courts and resident lawyers in regular practice, whose services are either entirely gratuitous or are given for partial compensation. In these cases there is usually one professor whose duty it is to perform the offices of dean, and whose more constant attention to the general interests of the department, and more frequent lectures on essential and practical subjects constitute him the working member of the faculty.

In most, if not all, of the schools named, there are systematic regulations as to pleading, moot courts, clubs for the reading of dissertations and the arguing of cases, &c., that contribute very greatly to their spirit and success.

In some of the schools—Cambridge Law School for example—a more limited course is provided for the benefit of the mercantile profession; embracing merely the leading branches of commercial jurisprudence, such as the law of agency, of partnership, of bailments, of bills of exchange and promissory notes, of insurance, of shipping, and of navigation and other maritime concerns. In some also—as in the department of law of Columbia College—there is provided a post-graduate course for those who desire to pursue their studies beyond the two years required for the diploma.

The only degree conferred by any of the American schools is that of bachelor, (LL. B.,) which comes as a matter of course at the end of the two years' study in the case of all students of ordinary capacity and diligence. But this degree not being an award of the government, as is the case in those European countries where the schools are government institutions, and the graduate an officer of the government the moment he receives the diploma, does not of itself confer the right to enter the courts as a practitioner, though it practically amounts to that, since the formal examinations by committees of court appointment are, in such cases, a mere form and nothing else.

The terms of admission to the law schools of the United States are as simple as any young man in the world could ask; namely, fair morals and the age of eighteen (at Cambridge nineteen) years. No educational foundation and no professional reading is a prerequisite. Though as ignorant of the world and as intellectually undisciplined as a Patagonian, if of the required age, he is admitted to the courses without hesitation, on making advance payment of the matriculation and tuition fees, which range between *nil* and $100 per annum.

The number of students in annual attendance upon these several schools varies from ten for some of the newly-organized departments in the far West to five hundred and over; the largest number being found in the University of Michigan, and the total number in all being about 1,200.

If, at the conclusion of this brief account of legal education in our own country, I were to assume to indicate its prominent deficiencies, I should point to the qualifications for admission demanded by the schools, the limitation in number of courses and degrees to one, and the inadequacy of the courses actually given to meet the demands of the profession.

I am familiar with the reasons urged by those who establish such conditions, or rather provide that no conditions shall exist; namely, the newness of our rapidly growing country, and the steady demand for lawyers in all parts of it, and the probability that, if admission to the schools were made more difficult, a still larger proportion than now would take the short cut to the courts by way of licenses easily acquired in any portion, and especially in the newer sections of the country, after a very little reading and some show of knowledge of the elementary

branches of law. But I am none the less certain that one of the very best ways to make the law school more eagerly sought by the better class of young men, as a door of entrance to the profession, is to make admission to it a test and evidence of general fitness for the profession. Besides, it is hardly a question whether it is the privilege of the educational representatives of a great profession that ought to be in reality, as it is nominally, a *learned* one, to degrade it by publicly and falsely admitting that the discipline of mind and the knowledge gained by a study of language, mathematics, the physical and natural sciences, history, metaphysics, and moral philosophy, are not essential to a full mastery of the principles of that profession whose complex and difficult office it is to deal with those subtile and intangible forces that govern the individual man, and control in the organization of government and in the development of human society. The mere collector of dues, the incumbent of notarial office, and the conveyancer may discharge their various duties on the simple basis of common sense, rudimental school education and knowledge of statutory law; but the *lawyer* will more nearly approach a complete fitness for the comprehensive field of duty upon which he is supposed to enter when he crosses the threshold of the superior courts, just in proportion as he approaches more nearly to a perfect use of his own powers and a mastery of all law, material, metaphysical, and social, as well as statutory, constitutional, and international.

These general remarks apply with no less force to the narrow limitation of their courses of study by which our law schools are characterized, than to the conditions of admission. In the older countries of Europe, where the study is rendered more complicated and difficult by the prominence and importance of the canon law, with which we have but little to do, as well as by the entanglements and conflict of laws, ancient, feudal, and modern, and the weight of numberless precedents, some reasons exist why the term of study should be longer than in this country, where the domain of written law is proportionally larger, and the intricacies of the practical department of the study proportionally less; but the difference in circumstances is not so great as the difference in requirements as to both preliminary and professional study. Moreover, the usual course of study, as laid down in the programmes issued by our schools, is itself convincing evidence of the validity of the criticism here made. They are eminently practical, and perhaps quite faultless in their adaptation to a certain limited department of the profession. But I must insist that the foundation they lay is not broad and deep enough for the professional career of the American lawyer.

In no other country is law, as law, and as a profession, so highly honored as in America. But the honor bestowed upon the profession is vastly more due to the reverence among our people for the law itself, and a certain glimmering conception in the public mind of what the profession ought to be, as the acknowledged highway to preferment and the

opportunities of statesmanship, than to anything it really is. In a word, our law schools and the profession of law in this country are the nurseries of politicians. I would make them nurseries of statesmen; and I would begin by demanding a suitable preparation for admission to the professional school, and by making the history of law and the principles of law—themselves resting on the deep foundations of natural, intellectual, moral, and social science—the very groundwork of professional study, and a fair knowledge of them a *sine qua non* of the highest honors conferred; and then, if necessary to this end, to procure the amendment of the conditions on which licenses are granted by the courts—that should be the next step taken.

Granting, as was conceded in the chapter on medical education, that a little science is better than no science, and that it is well to avoid making the conditions so difficult that none will enter the schools at all, what valid reason can be urged against establishing at once a higher and more protracted course of study, with a higher grade of honors, for those whose ambition is to become lawyers in the best sense? Would not the establishment of such higher course, especially if the instructional force should be competent and the terms reasonable, tend to draw into it many of the best and ablest who now attend upon the partial courses offered them, and at the same time exert an elevating influence upon all students of law, of whatever grade, and upon the whole body of the profession?

It seems to me that this is a matter of much moment. Our lawyers are also, in the main, our law-makers, our administrative officers, and the directors of our State and national affairs. How few of them have been students of political economy, of civil polity, and of the history of our own and other nations, is painfully manifest from the legislative discussions they hold and the laws they enact.

III.—SCHOOLS OF THEOLOGY.

The first Christian school of theology of which we have historic account was, in several important respects, a remarkable and most excellent model for all that should come after it. It was founded about the year 180, at Alexandria, by the learned and zealous Pantænus, a convert from the philosophy of the Stoics, among whom he was eminent. Its aim was to give the student a broad and generous preparation for his sacred mission by securing to him the best encyclopedic culture of the age, on the theory that he whose work it was to be to lead men to a knowledge of God and into relations of harmony with Him, should himself first have the most complete possible knowledge of both God and man; of God, by a study of His attributes as manifested in all His works, no less than by the communications of His Spirit with the individual human soul; of man, by a study of his nature, physical and spiritual, and of all the circumstances, both material and social, in the midst of which he is placed. The pupils of this school were accordingly taught not only the

doctrines of the church, the history of the church, and the peculiar offices of the ministry, but likewise the Hebrew language, mathematics, physical and political geography, natural philosophy, astronomy, logic, rhetoric, metaphysics, and ethics. It was in this school that Origen studied and afterward taught. Being in fact a school of general culture, with a theological department, it attracted to its courses many pagans, and became a center of great influence. It continued until near the middle of the fourth century, from which time forward, until the dawn of the Renaissance, theology appears to have been taught solely in private by the learned and zealous clergy of the times, and in monasteries, which for many centuries were almost the only guardians, as the clergy were the chief promoters, of learning. One of the monasteries of this period had a school—the school of St. Médard at Soissons—in which there were, in the sixth century, no less than four hundred monk pupils. Indeed, it may be assumed that during this long period, from the decline of the Alexandrian school to the beginning of the ninth century, about all the schools in existence were theological, for, with rare exceptions, there were no schools but those of the monasteries, and they were designed for the exclusive training of youth for the service of the church. In A. D. 816, however, the council of Aix-la-Chapelle determined upon the opening of a lay department in some of the hitherto exclusive schools, from which time forward, for a considerable period, the school of the monastery was here and there dual, consisting of the *schola interna*, for youth in training for the church, and *schola externa*, for boys not in such training. Nevertheless, the theological spirit and the theological department were still dominant.

At length, late in the eleventh century, came the new theological era, introduced by that brilliant succession of scholastic theologians, William de Champeaux, Pierre Abelard, and Peter Lombard, who were the first to make public applications of the dialectic methods of philosophy to questions of theology, and whose remarkable lectures in private schools of divinity and in the University of Paris drew thousands of the young men of genius and ambition from all portions of Europe, and made the divinity schools of the French capital, educationally, the theological center of the world.

Theology was also taught during this period, and throughout the twelfth century and the first half of the thirteenth, from individual chairs in Italy and England, and in 1257 was formally opened the faculty of theology of the University of Paris under the charter given by Philip Augustus fifty-six years before. Of course the multiplication of chairs only increased the influence of divinity teaching in the university and swelled the tide already so great, and accordingly during the next hundred years Paris was literally thronged with theological students, gathered from all the nations. So strong was the desire, so keen the appetite for the discussion of divinity and philosophic questions together, that the study of the Roman and French law was carefully and

persistently kept out of this greatest of the universities of that particular period until a much later day, from the fear of encroachments it might make upon the then supreme influence of the theological department.

The example of the Paris University in creating a faculty of theology as one of its departments was followed in succession by the various universities that sprang up in many European countries, so that very soon such schools were found not only in France, Italy, and England, the first to establish them, but also in Austria and all the other Germanic states, in the Netherlands, and even in Scandinavia.

The number of university faculties of theology in the European countries, and the total number of full professors in the faculties of each, are, at present, as follows:

Number of faculties and professors of theology in Europe.

Countries and states.	Faculties.	Professors.	Countries and states.	Faculties.	Professors.
France	7	42	Electoral Hesse	1	9
Spain	6	.....	Mecklenburg-Schwerin	1	4
Italy	8	64	Netherlands	3	14
Prussia	8	106	Belgium	3	.....
Austria	4	42	Denmark	1	5
Bavaria	3	25	Norway	1	5
Saxony	1	14	Sweden	2	8
Baden	2	14	Finland	1	4
Wurtemberg	2	13	Russia	1	7
Hesse-Darmstadt	1	6	Great Britain	8	34
Saxe-Weimar	1	7			

The theology of these faculties, at first and even down to the days of the reformation quite the same in all, after that grand upheaval naturally became so widely different as to demand separate faculties for the leading systems of theology. The divisions were not numberless, however, as in this country, for there were but two ecclesiastical divisions in Europe that had any influence in the direction or control of civil affairs, and hence could have any voice in forming those faculties—the Catholic and the Protestant. Every faculty of theology was the representative of one or the other of those two branches of the Christian church, and this is also true of all the continental faculties at this hour. In Italy, Austria, Bavaria, Russia, Belgium, Spain, and Portugal, they are exclusively Catholic; in the North German states, in Switzerland, Netherlands, and Scandinavia, they are exclusively Protestant; in France and Baden they are divided—there being one of each class in Baden, and five Catholic to two Protestant in France, while the Wurtemberg University at Tübingen presents the anomalous feature of having within it both a Catholic and a Protestant faculty. In Great Britain we find that beginning of divisions of the Protestant church

which, in its yet freer, I may say perfectly free, course, has resulted in so great a number of different kinds of theological schools.

But the prevalence of neither one of these two great branches of the Christian church has insured to the dominant branch a satisfactory representation of its doctrines during the past three centuries; for while the authority of the state church has usually held the teacher in the theological faculties to a faithful representation of its doctrines, yet even before the reformation, as already intimated, the philosophy of Abelard and his compeers had opened the way to serious disturbances of the dogmatic theology, so that the original independent schools and seminaries of the church were not only continued, but also strengthened and multiplied as a necessary safeguard against the growing tendencies to heresy in those maintained by the state. And when, again, in 1517, the fearless and irrepressible Luther startled and electrified the Christian world by the strokes of his hammer nailing his ninety-five theses to the doors of the *Schlosskirche* at Wittenberg, and boldly maintaining the rights of conscience, of private judgment, and of freedom of discussion, thus by another great example demonstrating the danger of a reliance on the university faculties for religious instruction, still more extraordinary efforts were made by the Catholic church to increase the proportion and influence of its own divinity schools. So strong was this feeling that the councils of the church took vigorous measures to insure the desired object by the institution of seminaries for the training of young men for holy orders without their being exposed to the corrupting influence of the universities. In some countries these seminaries were established in every diocese, and in Italy they even exceeded the extraordinary number of these. Each of them was under the exclusive control of the bishop of the diocese, the rector or governor being appointed by him, and their income supplemented, when necessary, by subsidies from his revenues. At first strictly confined to clerical instruction, they were afterward induced, by the offer of rich endowments and lay and municipal aid on such conditions, to open their doors for the instruction of lay pupils in various localities where separate lay instruction could not otherwise be so easily maintained. In some cases the government, being either partial to the church or desiring to make sure of its support, even placed portions of the state domain at their disposal, and diverted various lay and municipal foundations for their use. In these various ways the property of the diocesan schools increased, until in some cases they became very wealthy. In Italy, alone, the number of these seminaries exceeds the number of episcopates by twenty-nine, the total being no less than two hundred and sixty.

After the reformation had become an accomplished fact, influences of a similar character operated in the German states to produce an increased number of church schools in one or the other of the conflicting interests; and so elsewhere in like manner, until at last, under the lead of the Calvins, and Knoxes, and, later still, of the doubly-heretical

Spinoza, Kant, Jacobi, Fichte, Schelling, and Schleiermacher, Protestantism, scarcely less intolerant of new views and interpretations, was seen to look upon the faculties with suspicion and to follow to some extent the example of the mother church in fortifying itself, by means of schools solely under its own control, against the rationalistic subverters of its religious faith. Nevertheless, the Protestantism of continental Europe possesses a unity and solidarity nowhere else found in that great branch of the general church, and only surpassed by that of Catholicism.

In England the case is far different as to the multiplication of sects, though not so different, after all, as to the non-multiplication of independent church schools of theology. The Church of England divinity schools have been so intensely such, and nothing else, that schools independent of the university faculties have not been necessary.

In America, where we have no connection between church and state, and no state schools, there can be no theological faculties in the State universities, and each denomination is left to look out for its own theological interests by the establishment of such schools as it may seem to require. The present number in the United States exceeds ninety; the distribution of them among the leading denominations, together with the number of professors and pupils in all the schools of each, being very nearly as follows:

Number of schools of theology in the United States.

Denominations.	Schools.	Professors.	Students.	Denominations.	Schools.	Professors.	Students.
Catholic	21	124	829	Protestant Episcopal	4	21	271
Presbyterian	17	62	917	Methodist Episcopal	4	14	328
Baptist	13	31	236	German Reformed	3	9	108
Congregational	7	26	282	Unitarian	2	10	40
Lutheran	7	22	213	Universalist	2	4	.....

Taken as a class, schools of theology are far more numerous than those of any other profession, with an average number of professors and pupils much less.

In the matter of the subjects taught, and the extent of the qualifications demanded for admission, though there is considerable diversity among the nations, there seems to be a nearer accordance and harmony of opinion than is observed in either medicine or law. The requirement as to admission is everywhere in Europe pretty nearly the same, the educational qualifications being, in general terms, represented by the degree of A. B., or the certificate of maturity from the gymnasium. In the United States, the qualifications demanded, though somewhat more various, amount to pretty nearly the same. Thus, at Cambridge Divinity School, candidates for admission must be either graduates in the arts,

or possess the ability to pass a preliminary examination in the following books and branches: Latin grammar, Virgil, Cicero's Select Orations and Sallust, Greek grammar, Zenophon's Anabasis, the first book of Herodotus, or the first two books of Zenophon's Memorabilia, geography, arithmetic, geometry and algebra, logic, rhetoric, Locke's Essay on the Human Understanding, (Book III,) intellectual and moral philosophy, and Butler's Analogy.

The courses of instruction all necessarily embrace the four great departments of theological study, namely, ecclesiastical history, exegesis, systematic theology, and practical theology, but the extent to which these general subjects are divided up among different professors, as well as the extent to which auxiliary branches and correlative subjects are taught, and the term of study are, of course, as variable as the means and the educational and professional views of those who have established and those who conduct them.

In France, where theology no longer enjoys its early pre-eminence, but is at present a third-rate profession, the number of its chairs in none of the faculties exceeds seven, not even in the great Academy at Paris, whose faculty of medicine has over thirty, whose faculties of law, of the sciences, and of letters have more than twenty each, while in all, except the one at Paris, the number is only five or six. The five chairs regarded as essential are those of dogmatic theology, Christian morals (*morale évangelique*,) ecclesiastical history and discipline, pulpit eloquence, (*éloquence sacrée*,) and Holy Scriptures. The sixth chair, when added, is for the teaching of ecclesiastical law, and the seventh is the chair of the Hebrew language. The term of study is three years.

The Italian schools average eight full professors, with departments varying somewhat in the several faculties, but—taking the faculty of the Royal University of Turin as an example—being substantially as follows: Moral theology, speculative theology, Holy Scriptures and Hebrew language, scholastico-dogmatic theology and sacramental material, biblical institutes, theological institutes, ecclesiastical history, and sacred eloquence. These studies occupy five years, biblical and theological institutes occupying the first year; moral and speculative theology, and sacramental material, occupying the second and third; and moral theology, speculative theology, sacramental material, and the Sacred Scriptures, the fourth and fifth years.

In the German states generally, the term of study is less—in Austria, four; and in Prussia and most of the other states, three years—and the courses take a wider range. The number of full professors is often ten or twelve, besides which there are sometimes as many as twenty-five extraordinary professors and *Privat-docenten*, who deliver courses of lectures on such subjects as they may select. Where the four years' course is given, as in the Austrian faculties, the distribution of subjects is about as follows:

First year. Fundamental theology, or general dogmatics, and the

rational ground principles (*Grundlage*) of the whole of positive theology, together with the study of the Old Testament; history of revelation, and introductory lessons on the general study of the Bible; exegetical lectures; and Hebrew language. The number of lectures, weekly, during this year is sixteen.

Second year. Special dogmatics, and study of the New Testament, with appropriate philosophical criticism; the number of obligatory discourses and lessons being eighteen, weekly.

Third year. Moral theology; dogmatics; history of the church, with a historical study of the dogmatical unfolding of ecclesiastical systems. Number of weekly lectures, eighteen.

Fourth year. Canonical law; practical principles, or pastoral theology; conclusion of theological encyclopedia.

The number of weekly exercises, it will be observed, is not so great but that a majority of students, pretty well disciplined as they must be before entering the theological school, may find time to attend to branches of study not included in the obligatory course. Accordingly very many of them devote several hours weekly to the study of foreign languages, for which they are likely to have special use, to the brilliant and profound lectures given by the *Privat-docenten* and extraordinary professors on biblical exegesis, speculative theology, church history, canonical law, &c. Some idea of the range taken by these non-obligatory exercises may be gained by a reference to the subjects announced by the *professores extraordinarii* and *Privat-docenten* of the University of Berlin for the winter semester of 1867; a translation of which programme will be found in the succeeding chapter on universities.

In the Scandinavian countries, in Finland, Russia proper, Great Britain, and the United States, the average number of professors, scope of studies, and duration of courses are very nearly the same, and hence do not require separate consideration. The course of study is three and four years, the longer being common in Scandinavia and the shorter in Great Britain and the United States, and the number of professors averages about four. The course of study, with so small a corps of professors, can hardly do more than begin the essential groundwork of a theological education, which, among the leading schools of this country, is understood to embrace the Hebrew language; the principles of criticism and interpretation as applied to the Bible; natural religion, and the evidences of revealed religion; systematic theology, Christian ethics, and practical theology; church history, church polity, and pulpit eloquence.

The cost of a theological education is least in Italy and greatest in England and the United States.

The degrees conferred in European countries are those of bachelor in theology, licentiate in theology, and doctor in theology. In Great Britain theological degrees are sometimes honorarily conferred, and often, when not thus conferred, are given with but little regard to the real claim the applicant may have by reason of a mastery of the

studies a knowledge of which the titles are supposed to imply. On the continent honorary titles are very rarely if ever conferred, and never after a course of study unless a pretty severe test has been made of the attainments of the candidate by both written and oral examinations. Consequently, in France, Germany, and other European countries, the title of doctor implies with much certainty that the bearer is at the same time a general scholar and a learned theologian. In the United States it means but little more than that he who wears it, though often sadly wanting in any sort of culture, in the best sense, is popular with his denomination or has a partial friend in some college board.

All in all, the schools of divinity throughout the world are, theologically speaking, in as good a condition as any other class of professional schools. And yet, even in this regard, everywhere outside of Italy too little time is given to the systematic study of divinity; everywhere outside of Germany they are so numerous and hence so weak in their instructional force as of necessity to do their work inadequately; and everywhere, excepting no country, too little scope is given to the courses of study. Religiously considered, the schools are almost universally too narrow and cramped in their ideas of the office of the church in the world, and hence themselves fall far short of fulfilling their true mission. There is much freedom of thought in some of them—in those of Germany more than in any of the rest—but it is too exclusively the freedom of speculative and rationalistic philosophy, a philosophy that takes loose rein, but runs mainly in one single direction, a sort of tangential freedom that is even in danger of passing beyond its true orbit; whereas the freedom of the theological schools should follow the order of the celestial systems, sweeping in vast orbits through the universe of truth, but, in their sublime courses, unceasingly held obedient to their eternal source and center.

Originally, the priest was, to the people of his ministration, at once the embodiment of the wisdom of the world and the gracious representative of the law of God. Such should he be to-day. The offices of religion are not the most sacred simply because they are so directly from God, who is equal authority for every good work; they are so directly from God, who is equal authority for every good work; they are, also, sacred because their fulfillment involves the most precious and most enduring, nay, *all* the interests of man. There is no knowledge, therefore, whether of things material or spiritual, temporal or eternal, that bears in any degree, as all knowledge must, upon the spiritual welfare of man, which the profession of the Christian ministry should not, as far as possible, attain. As the subject with which the schools of theology deal is infinite, so is the field of study they assume to open without other real boundary than the limit of human capacities and powers.

It is not assumed that the vast amount of knowledge and that high culture of all the powers herein implied are attainable by even the most

gifted within any reasonable period of pupilage in the schools, for these are the task of life; but the groundwork of such attainments should there be deeply and broadly laid by that profound, devout, and comprehensive study of the attributes of God and of the nature and relationship of man which alone are able to develop the spirit of a true and acceptable worship, or lead to a just appreciation of the priestly office and of priestly duty. If the schools could comprehend this and would hold themselves, with singleness of purpose, to such an ideal, our ecclesiastic teachers would soon be found approaching more nearly in their spirit and influence to the Great Teacher himself; the lines of religious sectarianism would be less and less narrowly and intensely drawn; and the church, at last brought into complete harmony with its Divine Head, would then have more fully begun the fulfillment of its mission among men.

CHAPTER XI.

NORMAL SCHOOLS.

General retrospect—Enumeration of normal schools in all countries—Schools of Prussia and other German states and of Switzerland—Schools in Saxony—French schools, primary, secondary, special, and superior—The minister of public instruction on Italian normal schools—Other continental schools—English normal schools—Normal school instruction in America—Normal University of Illinois.

With the progress that is now making in the establishment and perfection of schools for the professional training of teachers, the generations next succeeding this present will hardly realize that, although medicine and law and theology had for centuries been recognized professions, and were hence provided with schools for the training of those who were to engage in them, it was not until after the further lapse of full thirteen hundred years that the thought occurred to any one, or at least found practical application or even public expression, that the business of teaching was of so delicate, difficult, and responsible a nature as, above all other professions, to require special institutions for the preparation of those who were to assume its duties. Even now it is difficult to realize that up to the beginning of the present century the importance of such institutions had found prominent and practical recognition nowhere among the most advanced nations outside of the Germanic states. The art of escape from bodily disease, from the entanglements of legal subtleties and complications, and from the torment reserved for the impenitent in the world to come, was of such palpable importance as to demand the establishment of schools for systematic instruction therein; but the idea that there were any particular ways better than others to educate all the faculties of the child, bodily, intellectual, moral, and religious, so as to insure to each human being the earliest and most complete use of all his powers, this advanced idea seems not yet to have had place in any country of the world. And so, for generations, the work of popular instruction was left to the management of such persons as could find no other more honorable and remunerative employment.

At last, however, in 1681, the thought happily came to the Abbé de La Salle, canon of the cathedral of Rheims—a place distinguished for its learning as long ago as when, under Roman rule, it was the capital of Belgica Secunda—that being exceedingly difficult, and requiring not only much learning, but likewise a very thorough knowledge of human nature, as well as of the laws of individual development, the responsible work of training youth should not always be left to the incompetent bunglers who, as a rule, were then assigned to its performance. And being a practical philanthropist, he at once instituted a school for the

training of teachers in the principles of their profession; placing it afterward, in 1684, under the charge of that benevolent organization, the Brothers of the Christian Schools. This was the first normal school.

Again, in 1697, Augustus Herman Franke, a German philanthropist, formed, in connection with an orphan school he was conducting at Halle, in Prussia, a teachers' class, composed of pupils who assisted him at stated times, and twelve of whom, in 1704, he constituted what he called his *Seminarium Preceptorium*, or teachers' seminary. The twelve apt pupils thus selected, with their zealous teacher, constituted the first German normal school. After being trained for two years in the principles and practice of teaching, these pupils, together with numerous successors in the school, went forth as missionaries of the new gospel of education, until the leading minds of all the German states were at length aroused to the great importance of the work thus feebly begun.

In 1735 a seminary for teachers was established on a more liberal scale at Stettin, in the Prussian province of Pomerania; and in 1748 still another at Berlin, by Frederick the Great, who, by 1752, had become so deeply impressed with the importance of such institutions that, by a royal decree of that date, he provided that thenceforth all vacancies occurring in the schools established on the Crown lands should be filled by teachers selected from the pupils of this seminary. He also provided an annual stipend for twelve of the most worthy graduates to aid in their support until employed as teachers of the school. This institution, ably managed by Hecker, a former pupil of Franke, did a noble work in those early times of the normal-school movement, and by its success, as did also its predecessors, contributed to the successive establishment of others of the same class not only in Germany, but also, though later, in other countries, Austria following in 1767; Switzerland, in 1805; France, in 1808; Holland, in 1816; the United States, in 1839; England, in 1840; Belgium, in 1843; and subsequently all other enlightened nations, as will appear by the following statement of the countries, principalities, and subordinate states that have adopted them, together with the number of schools in each:

Prussia, including states recently absorbed, 62; Austria, 11; Baden, 4; Bavaria, 11; Wurtemberg, 7; Saxony, 10; Hesse-Cassel, 3; Hesse-Darmstadt, 2; Anhalt, 3; Saxe-Coburg-Gotha, 2; Saxe-Meiningen, 1; Saxe-Weimar, 2; Oldenburg, 2; Brunswick, 1; Luxembourg, 1; Lippe, 1; Mecklenburg-Schwerin, 1; Mecklenburg-Strelitz, 1; Lubec, 1; Frankfort, 1; Switzerland, 31; France, 141; Holland, 2; Denmark, 8; Sweden, 5; Russia, several, definite number not known; Italy, 53; Spain, several, exact number not known; Greece, 1; England and Wales, 23; Scotland, 2; Ireland, 1; Nova Scotia, 1; New Brunswick, 1; Canada East, 3; Canada West, 1; Maine, 2; Massachusetts, 4; Rhode Island, 1; Connecticut, 1; New York, with provision already made for four, 2; New Jersey, 1; Maryland, 1; Pennsylvania, with plans for twelve, 4; Michigan, 1; Indiana, nearly ready to open, 1; Illinois, 1; Wisconsin, with provision

made for six, 2; Iowa, 1; Minnesota, 1; Kansas, 1; Kentucky, 1; South Carolina, 1; California, 1.

The foregoing figures, for most countries, show merely that a beginning has been made in this noble enterprise of establishing schools for normal instruction. The zeal with which the work goes forward, however, is only equaled by that which characterizes the universal movement in the interest of industrial education.

PRUSSIA, SAXONY, SWITZERLAND.

In Prussia, Saxony, Switzerland, and probably in some of the other states, a further increase in numbers is hardly demanded by the interests of primary education, as the schools already established are quite competent to supply teachers for all the vacancies occurring in the schools of this grade; so that the wisdom, energies, and resources of the local, provincial, and state governments may be exclusively devoted to the improvement of such as at present exist. And noble progress are they making in this work. Even now scarcely anything seems wanting to the completeness of their system, and the practical wisdom, zeal, and thoroughness with which it is carried out.

THE GERMANIC STATES.

The German states, in general, seem to have based their action in establishing normal schools upon the following general principles:

1. The necessity to the growth of the state in wealth and power, and to the highest attainments in civilization, that education should be not only universal but of the best sort.

2. That this necessity of the state, re-enforced by the natural and no less sacred rights of the individual to the means of development, constitute a demand upon the government for the employment of all needful material resources, and the highest wisdom for the realization of this universal and best education of the whole people.

3. That such realization is clearly impossible without the agency of a great profession, concertedly, wisely, and zealously devoted to that special work.

4. That such a profession is only possible through the adoption of measures calculated to make it at once honorable, secure, and independent.

5. That while this condition of the teacher's profession is largely possible by means of generous and direct legislation, as, *e. g.*, by making the teacher a government officer, and, as such, securing to him a reasonable degree of independence of the whims and caprices of the people he may serve; granting him virtual exemption from the military service; insuring to him a fair compensation during the period of active service, and a moderate pension when no longer able to teach—measures for the early adoption and faithful execution of which the German states, as before remarked under the head of primary education, are entitled to

the first and highest honor—and by making the legislative requirement that all persons admitted to the profession should first be rigidly measured by a judicious standard of qualifications, it was nevertheless utterly impossible that such necessary condition of the profession should be fully realized without the co-operative agency of professional schools for the thorough training of all who were to be the instructors of the youth of the country.

Influenced by such convictions, the intelligent governments of Germany began the establishment of their normal schools. Let us see, in the next place, by what particular principles they were governed in the execution of their general purposes.

As there were two general classes of schools—the lower primary schools of the rural districts, and the burgher and other higher schools of the villages and cities—there should be two classes of normal schools to supply them; and hence we find both "rural normal schools" and "normal seminaries" for such as are to be masters and teachers in the country, and in the higher primary schools, the principles of their organization being in no respect different.

Again, the questions of sex and of the church were involved. These they settled by liberal provision for the establishment of both male and female schools, and schools of both the Catholic and Protestant faith. The small number of female teachers employed—under the mistaken notion that women are not naturally so competent to this work as men—rendered the establishment of but few female schools necessary, and so we find, even yet, but a small number of them in operation. The religious question has been variously settled, according to circumstances. Where the proportion of either sect was small, there has been but one school established; the minority being provided with religious instruction in harmony with its own preference. Where the sects were pretty evenly divided, the more general course adopted has been to establish two schools. And in a few cases there are found schools which in their organization, including the staff of teachers, are both Catholic and Protestant.

The question of number and location of normal schools, in the estimation of the governments, appears to have two very natural considerations, to wit: economy of establishment and support on the one hand, and the educational interests of the people on the other. It was possible for the governments, with the co-operation of the localities to be directly benefited, and with large private benefactions—of which there have been many—to create and maintain as many as five, six, or seven in each of the provinces, so that each district should have at least one; and if the number were so few as to require the pupils to go quite beyond the influence of their home associations, it would have the twofold effect, first, of diminishing the value of the instruction given to each pupil, by rendering personal attention to the wants of each less possible; and, secondly, of diminishing their sympathy with and interest

in the class of people among whom they were destined to labor when prepared to enter the profession of teacher. The educational considerations prevailed, and many of the German states have normal schools, of superior character, in such number that the students who attend them are all within a day's journey of their homes, with which they keep up an uninterrupted association during the whole period of their study; and to which, after the hard labor and self-denying discipline of the school for a term of years, they are happy to return should fortune assign them to the scenes of their boyhood as the field of their professional labors.

The question of support was settled on the most liberal basis; the plan adopted comprehending not only the entire support of the schools themselves, with the best corps of teachers the country could furnish, but also the entire, or at least half, support of the students themselves while at school, and all necessary aid after graduation until they are practically established in their profession.

It will thus appear that the normal schools of Germany rest upon the same general basis with the military schools. The schools are state institutions; the officers and professors are officers of the state; and the pupils are cadets, preparing for the civil service.

Inquiring more particularly into the organization of the schools and the regulations which govern them, we shall not fail to be still further impressed with the unexampled liberality, carefulness, thoroughness, and jealousy for the sacred rights of education with which the minutiæ of the system has been devised.

Each normal school consists of the professional or normal school proper, and a primary model school or school of practice, which also serves the purpose of a primary school for the education of the children of that portion of the town or city where the seminary is located.

The number of pupils of the normal schools is usually limited by the different states to about seventy, all of whom are required to board in the institution, that their habits and daily lives may be subject to the direction of its officers and professors, the number of which is usually four or five.

The director of the school is intrusted with large powers as the administrative officer of the school, and at the same time gives instruction—generally in the principles of teaching—to the extent of several hours each week. Directors of Catholic schools are designated by the Catholic bishop of the district in which the school is located; if a Protestant school, by the Protestant clergy of the district; the approval of the minister of public instruction being in all cases necessary. The professors are chosen by the director, with a like approval.

The examinations for admission are open to all candidates, without regard to class, not under seventeen years of age, (in some states the minimum age is eighteen,) and as the number who can be received is limited, the examinations are really competitive, only the picked candidates gaining admission—a circumstance which greatly contributes to

the high character and constant improvement of the profession. They are conducted by the director and professors of the school, in the presence of the magistrates and religious ministers of the district.

Each competitor must establish:

1. By certificate from a religious minister, that his past life has been moral and blameless; also, that he has been baptized.

2. By certificate from a physican, that he enjoys entire freedom from any chronic disease or hereditary taint; that his constitution and health are sound; and that he has been vaccinated within two years.

3. By certificates from two or more teachers, personally acquainted with him, that he has been characterized by industrious and moral habits, and is possessed of intellectual abilities adequate to the high duties of the teacher's profession.

These important conditions being established, the several competitors are then carefully and rigidly examined in the following studies, which constitute the full course of instruction in the highest of the primary schools, namely: Biblical history, the history of Christianity, the catechism, reading, writing, arithmetic, grammar, geography, German history, natural history, elementary principles of physics, singing, and violin music. After the examination, selections are made from among those designated as competent to enter, beginning with those whose qualifications are best, and proceeding downward until a sufficient number have been taken to fill the vacancies in the school.

Before entering their names as pupils, however, each candidate desiring to enjoy the national bounty must sign an agreement, first, to remain for three years after leaving the school at the disposition of the government, and during such three years to take any situation as teacher which the authorities of the district where the school is located may choose to offer him; or, second, in case of failure to obey the direction of said authorities within such period, or in case of a decision on his part to abandon the profession, to refund to the institution the whole cost of his education therein.

The course of study provided differs but little in the several states. In all it is divisible into three essential parts—the religious, the intellectual, and the industrial.

The religious training is deemed of primary importance, since it is upon the teachers of the schools that the country must largely depend for the inculcation of those moral and religious principles which are the only sure foundation of private and public virtue. The government rightly assumes, as a cardinal truth, that no one can be fit to lead the children of the state through the critical period of pupilage in the schools who is not only pure in heart and reproachless in life, but whose aspirations for the elevation of those committed to his charge are capable of becoming to them an inspiration, leading them to a higher appreciation of the beautiful and the good, and prompting in them sentiments of worship toward the Fountain of all Truth. Whether this ideal is often

realized, it is not so easy to determine; but it is certainly more likely to be where definitely desired and aimed at, than where not recognized as an essential condition of the best results.

The branches of study embraced by this religious section of the German course of study are: Religion—by which is meant general religious instruction, including, of course, in the normal school, an illustration of the best mode of imparting it; explanation of the Scriptures; Scripture history; the catechism; religious exhortation. There is, doubtless, sometimes an undue admixture of sectarian teaching with the purely religious instruction that should alone be given; but I believe I only reiterate the statements made by all who have studied the character of the German schools, that a more moral, exemplary, and truly religious class of teachers cannot be found in any other part of the world.

The intellectual training embraces a thorough review of the branches studied in the primary school, with new and extended courses in them, and in the science and art of teaching. In the Saxon schools, whose term of study is four years instead of three, as before remarked, the normal course also includes Latin, natural philosophy, geometry, and geometrical drawing. But Latin, and even French and English, may also be studied in the Prussian schools; and it is by no means unusual to find common-school teachers who are quite familiar with all these languages, by reason of a laborious study of them while in the normal school.

It is, moreover, a peculiarity of the German normal schools that the professors are required to give instruction in a great variety of practical matters which it is intended shall be taught, in turn, by the pupils when they become teachers themselves; such, for example, as how to treat the more common accidents to which people are liable; how to distinguish poisonous and the more common medicinal herbs, &c.; so that, in case of necessity, the teacher of the school may stand to the children and the people of the neighborhood in the place of a physician.

Great attention—more than in any other country of the world—is given to instruction in music; the pupils being required not only to gain a very complete knowledge of vocal music, in its various branches of choral, quartette, and concert singing, but likewise to learn the use of the piano-forte and organ, in addition to the violin, which in the primary school may have been the only instrument used. This fine musical command the German teachers almost all acquire is of very great advantage to them throughout their whole professional career; not only being an unfailing source of enjoyment to themselves, but giving them, when skillfully used, an extraordinary power over their pupils.

The study of drawing, particularly of linear and geometrical, constitutes still another feature of the instruction in the German normal schools—to which so little attention is paid in those of our own country—and adds another element to the superior power of the German teacher, whose skill with the crayon has been to me a marvel and delight

as often as I have witnessed it. There is hardly a single branch of study in which it is not available with great effect.

The industrial department of the training given by the normal schools consists in various exercises in the garden, invariably connected with them, and in such general service about the establishment as in less laborious and practical institutions is usually performed by hired laborers and servants; the motive of the government in making these regulations being less the one of economy to the institutions, than to insure a harmonious development of all the powers of the pupil, to promote his bodily health, to keep him thoroughly and vigorously occupied, and the better to qualify him for those necessities for economy and self-denial likely to arise in after life.

During the last year of the course, much of the pupil's time, during either the forenoon or afternoon, as the necessities of the normal and the model school may require, is spent in the practice of the teacher's art, under the eye and direction of an experienced master, so that when the end of the whole period of study is reached he is ready to enter upon more independent duty.

Examinations are held during the course at the end of each year; and, should there be any pupil in the school whose abilities, industry, or general deportment indicate a lack of fitness for the profession, he is retired from the institution. But, after all, it not unfrequently happens that the pupil reaches the end of the third or fourth year's study without such qualifications as are deemed essential to a proper discharge of the duties of independent teacher; and so the government has placed another bar at the door of exit, in the form of a most rigid and relentless examination, with three grades of certificates, and authority to turn back any whose attainments do not entitle them to even the certificate of lowest grade.

These senior examinations occur every year, and in the Prussian and most other German schools embrace the following subjects: Biblical history; the history of Christianity; the catechism; reading, writing, and arithmetic; grammar; local and physical history; natural history, including geology, mineralogy, zoology, and botany; the physical sciences; pedagogy, with practical management of classes; drawing; singing and chanting; the organ, the piano-forte, and the violin. The examination is conducted in the presence of the educational magistrates and the clergy of the district, together with such other persons as choose to attend, and continues about two days.

SAXONY.

In Saxony the examination also includes, in addition to the foregoing, geometry, the theory of music, logic, and psychology, and continues three full days.

Such pupils as prove themselves thoroughly proficient in all the branches taught receive a diploma marked "1," which means excellent,

and entitles the possessor to enter at once upon the discharge of the duties of independent teacher in any of the primary schools of the country. Those who fall below this and yet display qualities and attainments that forbid their rejection, receive a diploma marked "2," and those who rank a little lower still, a diploma marked "3." Neither a second nor a third rate diploma entitles the holder to enter at once upon the discharge of the duties of principal teacher. He must first serve two or three years as an assistant to some master, if the holder of a second-grade diploma, and then go back to the college and be examined again. Should he fail a second time, he must take another term of apprenticeship and study, and repeat the trial at a stated time, until he either enters the profession or is ruled unworthy to do so. The recipient of a third-grade diploma is obliged to return to the college at the end of the first year, and undergo another examination to test his improvement in those branches in which he was most deficient; and, in case he should give no evidence of application and progress, may be ruled out without further trial and deprived of the diploma already acquired.

And so at any time in the subsequent history of an approved and honored graduate, if he should seem to have grown a little rusty, or needs to be made better acquainted with the later and more approved methods of teaching, he may be required to return to the college and brush up for more efficient service; the government meantime continuing his salary for the benefit of his family, paying his traveling and other extra expenses, and furnishing a temporary substitute to take his place in the school during his absence.

But the normal school is also made a center and rallying point for all the teachers within the district to which it belongs, by periodical conferences held therein at annual or shorter intervals; on which occasions the professors, who make it a business to keep fully up with the times in all departments of the profession, present for consideration and discussion such new views and reported improvements as promise advantage.

With such schools and such state regulations governing the department of public instruction, it is hardly any longer a wonder that Germany and Switzerland—whose systems are nearly the same—enjoy the honor and blessing of the best primary school-teachers in the world.

FRANCE.

The French government, notwithstanding the pioneer movement of the Abbé de La Salle, and the later example set by Prussia and other continental states, did not fairly inaugurate the work of establishing normal schools until the Emperor Napoleon I began it by the creation of the *École Normale Supérieure* at Paris in 1808. After this, a long period elapsed, during which but little—comparatively—was done. But of late years there has been a more remarkable development of them

there than in any other country of Europe, the present number being, as noticed in the preceding list, 141; of which 87 are for males and 54 for females. Judging from the greater proportionate increase in the number of female as compared with male schools during the recent years, (the proportion since 1859 has been as 24 to 16,) it may be inferred that the government intends to add to the number at present existing until there shall be at least one of each kind in each department of the empire.

Of the 141 schools all are primary except the superior school at Paris and a recently established secondary school for the training of teachers for the scientific course, created by imperial decree in 1865, as an essential part of all the *lycées*.

The distinctive features of the French schools are the following:

1. The age for the admission to the male schools is sixteen years; that for the female schools being seventeen.

2. The candidates are examined in the chief town of the department in which they reside by a commission named by the rector of the academy to whose educational jurisdiction the department belongs, and the admission of such as succeed is announced by the minister.

3. The cities, the departments, and the state together provide a given number of bursaries, half bursaries, and three-quarter bursaries for pupils; besides which the school is allowed to receive pupils who pay for their board at prices varying from 300 francs to 420 francs, due in tenths at the end of each month until paid.

4. The bursaries are granted by the prefect of the department in council.

5. The recipients of the bursaries are known as pupil-masters (*élèves-maitres*) or pupil-mistresses, and, as a consideration for their education and exemption from military duty, are required, before admission, to enter into an agreement to serve the state in the capacity of communal teachers during the period of ten years from the date of graduation.

But the most interesting peculiarity of the French system of normal schools consists in the provision made for the instruction of teachers of secondary and superior schools.

The *École Normale Supérieure*, located at Paris, is designed to form professors for the higher, secondary, and the superior schools in the department of public instruction. It belongs to the class of schools called *internal*, or boarding schools, and both instruction and boarding are gratuitous. The term of study is three years. The course of study embraces two sections, the section of letters and the section of sciences.

The law requires that the candidate shall be either a native Frenchmen or naturalized citizen, between the ages of eighteen and twenty-four years; that, if over twenty, he shall produce a certification of liberation from the military service, signed by the mayor of the commune; that he shall be free from any bodily infirmity or taint of constitution that would unfit him for the instructional service; that he shall enter into a legal

contract to serve the State ten years in the department of public instruction; and that he shall establish, by certificates from the officers of the school to which he has belonged, whether as pupil or teacher, that he possesses the requisite moral qualifications.

The examinations for admission consist of two series; the first bearing upon the general qualifications of candidates authorized to compete, and determining the admission or non-admission of each of them to the oral examinations; the other series are held among the candidates admitted to the oral tests, in order finally and definitely to determine their admission to the school.

The first examinations are held in the academies of the empire, where all inscriptions or enrollments of candidates are originally made. They are exclusively written and bear chiefly upon literary or scientific studies, according as the candidate proposes to enter the section of letters or that of the sciences. The compositions required at these first examinations are written on the same subject by all the candidates in different parts of the country, upon the same day and within the same space of time. Those bearing upon letters consist of—

1. A philosophic dissertation in French.
2. A Latin discourse.
3. A French discourse.
4. A Latin translation.
5. A Greek thesis.
6. A composition in Latin verse.
7. A historical composition.

The compositions required of candidates for a place in the scientific section are—

1. The philosophic dissertation and the Latin translation required for the section of letters.
2. The solution of one or more mathematical problems.
3. The solution of one or more problems in physical science.

Such candidates as successfully pass these ordeals then present themselves, at an appointed time, at Paris, for the purpose of undergoing the second series of examinations and fulfilling certain other conditions, of which the following are chief:

1. Each candidate must produce the diploma of bachelor in letters, or bachelor in the sciences, according as he designs to enter the literary or scientific section of the school.
2. He must produce a legal contract to refund the cost of his board in the institution in the event of a failure to complete the ten years of service pledged to the state as a condition of free education.
3. Candidates for the section of letter must prove, moreover, that they have devoted one full and distinct year to the study of philosophy.

The oral examinations for the section of letters consist in explanations and questions upon the texts of authors studied in the classes of rhetoric and philosophy; for the section of the sciences, in questions

upon subjects embraced in the special course of mathematics as taught in the *lycées*. Moreover, candidates for admission to the scientific section are required to execute a drawing illustrative of a question in descriptive geometry, and to copy a given sketch of the human head.

At the conclusion of these final examinations the minister of public instruction formally announces the names of the candidates admitted to the school.

The studies embraced in the three years' course of the *École Normale* are extensions, in kind, of the branches already gone over by the pupils in the attainment of their degrees of bachelor, together with such others, more or less collateral, as are calculated to give the student a mastery of the whole field embraced in the courses of such superior schools as he may be called to teach in or to preside over. Thus, in the scientific section, the first year's course embraces the differential and integral calculus in connection with the physical and natural sciences. The second year carries the student still further in all these general departments of study, nor yet omits those higher philosophic, literary, and art studies which are essential to well-rounded scholarship. In the third year there is a division of studies, with more direct reference to the bent of genius and the future plans of the several scientific students—some devoting themselves almost entirely to pure mathematics and astronomy, others to physics and mechanics, and still others to chemistry and the natural sciences.

Examinations of all pupils are held semi-annually, and advance is allowed only when the pupil is thought to be prepared for the range of study next higher. During the third year, and to some extent also in the second, the pupils are favored with opportunity for practice in the *lycées* of the city. At the end of the full term of study all who have reached that point are admitted to an examination for the title of *aggrégé de lycée*, or, in ordinary parlance, for aggregation—a condition and title that confer the privilege of teaching in the *lycées* of France. Such candidates as acquit themselves with distinction in these trials have the choice of being assigned at once to any vacancies there may be in the *lycées*, or of spending another year or two in following a more advanced course provided for those who aim at the highest posts of professional work in the academies and other superior schools. The less distinguished pupil is immediately nominated to a *lycée*, but only to the post of assistant professor, with the privilege of returning, after one year's service in that capacity, and again presenting himself for aggregation.

The professors in the *École Normale* are known by the title of *maitres de conferences*. The number of those in the section of letters is 12; in the section of the sciences, 11. The officers are, first, the director of the school; secondly, the administrator of the school and director of scientific studies; thirdly, the director of literary studies; and, fourthly, the steward. The number of students is 110; the number of annual vacancies about 35.

Some idea may be gained of the estimation in which this great school is held in France, and of the great desire there is to enter it, by the fact that, with this small number of vacancies, the competition for admission is often between from three hundred to over four hundred bachelors of letters and of science. This fact will also show how potent an agency this school is becoming for the invigoration and elevation of the normal profession in France, and for the improvement of all classes of schools.

The pride felt in the school by the government is manifested by the beautiful edifice erected for it in *Rue d'Ulm*, by the superior equipments with which the scientific departments are furnished, and by the annual appropriations of about $60,000 so cheerfully made for its support.

After all my journeyings in foreign lands, with special visits to hundreds of schools of nearly every class, I find in the gallery of memory no picture to which I now refer with more profound interest and satisfaction than to this of the *École Normale Supérieure* of Paris, as I so often saw it in the *Rue d'Ulm*, with its pleasantly environed buildings bearing aloft the flag of the empire, its twenty-three able, learned, and zealous professors, and its one hundred and more intellectual, cultivated, and ambitious young men, all jealous, not alone for their own interests and reputation, but likewise for the honor and glory of France, and resolute in a common purpose to help in the work of placing her educationally in the front rank of nations. Would that every country in the world had a similar institution for the reformation and advancement of its secondary and superior instruction, by the introduction of new and better methods, by the weeding out of incompetent and spiritually dead professors, and by the infusion of new life and energy into all its higher schools and colleges. I know of no country that needs such an institution more than ours.

But the establishment and development of this school of high rank did not fully satisfy the learned and earnest minister who stands so worthily at the head of the department of public instruction, and in whose judgment some more special provision was necessary for the development of that great system of courses and schools created in the interest of scientific and technical education, to which reference has so frequently been made in the pages of this report.

The *École Normale d'Enseignement Spécial* has, therefore, been established to meet this want. On the subject of its origin and plan of organization and development I am glad to be able to quote from the minister, M. Duruy himself, who, in a circular letter of information and exhortation to the rectors of academies, accompanying a new plan of studies for the special schools and bearing date April 6, 1867, uses the following language:

* * * "When the Emperor Napoleon I wished to give a higher character to classical studies he founded the Superior Normal School, out of which have come so many celebrated men, who still form the main strength of the university. When one of my illustrious predecessors

undertook, thirty-three years ago, to organize, at last, popular instruction, he created normal schools for the departments, which furnish the primary schools with their best teachers, and the country and the Emperor with the most devoted servants. If, for forty years, special instruction, which has been tried under diverse names, has not succeeded in definitively establishing itself, one of the reasons of its failure has been the want of a staff of teachers specially trained for this system of instruction. The foundation of a special normal school will supply this want; and the university will soon be able to provide the *lycées*, the colleges, and the great communal schools with masters capable of seconding the industrial activity of the country by teaching all the applications of the sciences.

"This normal school, like the system of special instruction itself, will have a mixed character. Pupils will be secured for it by reason of scholarships founded by the state, the same as for the normal classical school; but there will also be departmental scholarships, as there are in the primary normal schools. Towns, as well as private individuals, have already founded such scholarships; and the school may also have independent boarders.

"The recipients of state scholarships will enter this school after a competitive examination, and the holders of departmental scholarships will enter after a competitive examination, or otherwise, on conditions that will be determined by the departmental authorities. The first-named will remain at the disposition of the state after the completion of their course of study and during the whole of their ten years' engagement. The others will be at the disposition of the departments and the communes that have provided the means for their education; but the functions and the needs in connection with this system are so varied that every pupil issuing from a special school will be sure to find good and remunerative employment for the knowledge he has there acquired.

"Some persons are of the opinion that this normal school should be established in Paris; but I think it will be better situated in the country. There will be as little want of good professors for this institution as there is for the seventy-two provincial lyceums; and at Cluny the pupils will find excellent opportunities for study, without being exposed to the dangerous seductions of a great city, where also they may run the risk of acquiring tastes at variance with the modest habits and the austere life of a teacher of youth.

"Three causes have hitherto hindered the development of the system of special instruction. There was a lack of teachers required for the purpose. This lack has been met by the establishment of the normal school. The salaries were wretched. The decree of the council of state allows their increase, and secures to the teachers in the special schools that outward dignity of position which is indispensable to the maintenance of the rank of the office. Lastly, the teachers were kept in an

inferior condition, and the resolution of which I am about to speak will cause this inferiority to disappear.

"In order to have good teachers, it is not enough to give them the instruction they will have to impart to others, and to secure to them, in return for their services, remuneration in accordance with that received by the functionaries connected with the other branches of public instruction; care must further be taken to honor their condition by elevating it in the eyes of others, and to open to their legitimate ambition access to the titles and honors which the university bestows upon proved merit. In accordance with this view, a special degree has been created, in order that this branch of instruction may also have its crown. * * *

"I trust, M. le recteur, that all these measures, taken together, will definitively establish a system of secondary instruction for the people. It is time that we should make speed. In the peaceful but redoubtable struggle in which the various industrial nations are engaged victory will not be to that one that can command the greatest number of hands, or the greatest amount of capital, but to the nation whose working classes are the most orderly, the most intelligent, and the best educated. Science continues its discoveries, and every day places at the disposal of industry new and serviceable agents; but, in order to be well applied, those agents—which are sometimes very delicate, and sometimes very powerful—require to be skillfully handled. This is the reason why, at the present day, industrial progress is so intimately connected with educational progress, and why questions which it is the duty of the university to examine and to solve have acquired so great importance, even as regards the material prosperity of France."

With an intelligence and comprehension of the wants of education and industry like this directing and governing the special instruction movement in France, we hazard nothing in predicting for it an early and glorious success.

To the reference above made to the national normal school for special secondary instruction I will only add that the general features of its organization and the mode of gaining admission are much like those of the superior normal school already described, except that the educational qualifications for entrance are not so high, and that the term of study is two years instead of three, with the privilege, however, of a third year accorded to pupils who design to qualify themselves for teaching in the higher special schools. The professorships are nineteen in number, to wit, of mathematics, of mechanics, of cosmography, of chemistry, of natural history, of French literature, of ordinary legislation, of industrial and rural economy, of history and geography, of the German and English languages, of physics, of grammar, of hygiene, of the science of accounts, of linear design and graphic works, of music, of gymnastics, of moral philosophy, and of pedagogy.

Connected with the school, and serving as a field for practice, there

is a special model college, with its own officers and with fourteen professors.

This first and only school of its kind has been in successful operation at Cluny for five years, the public interest in it growing from year to year. With its four classes of normal schools, namely, its school at Paris for the training of teachers for the *salles d'asile*, (infant schools,) its one hundred and thirty-nine primary normal schools, its normal school for secondary special instruction, and its superior normal school, all recently organized and crowded forward in their career of development by the enthusiastic spirit and energetic will of the distinguished minister of public instruction, sustained by the all-directing Emperor, it may be assumed that the French nation will, before many more years have passed, be able to present to the world a division of the grand army of teachers of which the most ambitious people might well be proud.

ITALY.

The Italian normal schools are organized upon a plan very much like those of France; the design having been to provide both a male and female primary school for each of the provinces. At present the number is equal to that of the provinces, and they are distributed in such manner as to make this limited number meet the wants of the several provinces as well as practicable. The government schools, which constitute a large proportion, are free as to instruction, and the whole support of a limited number of pupils is also furnished. The provincial and municipal governments likewise provide many free and partially free scholarships, as in France.

The minimum age for admission to the male schools is sixteen years, to the female schools fifteen.

The course of instruction embraces: 1. Religion and morals. 2. Pedagogy. 3. Italian language and rules of composition. 4. Geography and national history. 5. The principles of physical and natural science, and the elements of physiology and hygiene. 6. Calligraphy. 7. Arithmetic and elementary geometry. 8. Linear design. 9. Choral singing.

The general management of the schools is subject to a directing council, consisting of the inspector of primary schools, the syndicate of the commune, two persons elected triennially by the school council of the province, and the head of the school. Their immediate management is intrusted to a director for each, and an assistant or vice-director. The number of professors in all cases equals the number of branches of study above named, and not unfrequently there are others, charged with extra branches.

The female schools are also directed and chiefly taught by male officers and professors, with such assistance from one or two females as is necessary to the management of the boarding department, and instruction in needle-work and other like accomplishments peculiar to their sex.

The full period of study is three years, and satisfactory completion

entitles the pupil to the certificate of "master of superior grade;" but the course of study is so arranged that any pupil unable or not inclined to complete the entire course may, at the end of the second year, present himself for examination as a candidate for the diploma of "master of the second grade." This rule applies alike to the male and female schools.

Besides these fifty-two primary normal schools, Italy has again, after a suspension of sixteen years, a superior school in active operation at Pisa.

The *Reale Scuola Normale Superiore* is almost identical in its aims, and in the form of its organization, with the *École Normale* of Paris; being designed to educate professors and masters for the *lycei* and *scuole tecniche* of the kingdom, and being divided in like manner into two sections, viz.: 1. Letters and philosophy. 2. Physical and mathematical science. The term of study is three years. At present but twenty places are entirely gratuitous, admission to which is gained through competitive examinations.

Italy is greatly in need of a large number of efficient and thorough normal schools; and it is gratifying to know that those now in existence have already begun to feel the inspiration that has lately entered into the educational department of this long-dismembered and half-dead, but now united and living kingdom.

OTHER CONTINENTAL NORMAL SCHOOLS.

Of the other continental normal schools but little requires to be said. Those of Spain, lately established, resemble those of France and Italy, after which they were modeled. The schools of Belgium are essentially French. Those of Holland differ but little from those of the German States, except that, instead of having model schools attached to them, the pupil teachers are admitted to the public schools of the cities a certain number of hours each day for practice. I failed to find anything in Denmark that should be considered under this head. In Sweden the case is different. The first seminary for teachers was opened at Stockholm in 1861, with a principal and five teachers. Since then a female school, with a lady superintendent, three male and three female teachers, has been established there. The number of pupils attending both in 1867 was one hundred and thirty-five. Besides the usual teaching in such schools, the German, French, and English languages are added; model schools are attached. In 1866 a school was also opened at Skara, and since then a private school has been established at Gottenberg and Nordköping. In Russia but little has yet been done directly for this profession. All these northern countries, however, have imbibed much of the general European spirit of progress, and are steadily moving in the direction of improved and more liberally furnished normal instruction.

ENGLAND.

English normal schools have been spoken of, in another place, as dating their origin no further back than 1840. In doing so I was not oblivious of the fact that, as long ago as 1798, individual movement was made in that direction at London by Joseph Lancaster, the father of the monitorial system. But this movement was similar to those of the Abbé de La Salle, in France, and of Franke, in Prussia, a hundred years before, and can hardly be considered a beginning of the establishment of normal schools proper.

The real beginning was in 1839–'40, when James Phillips Kay, (now Sir James Kay Shuttleworth,) who had just completed a tour of observation of educational matters in Prussia, and who was that same year appointed first secretary of the newly-created Committee of Council on Education, undertook, together with Mr. Tufrul, the establishment of what is known as the Battersea Training School. This was also a private enterprise; the institution having been founded and put in operation at the expense of these two gentlemen, in the belief that its success would ultimately lead the government to undertake the work on a scale commensurate with the great wants of the kingdom. Their expectations as to the training school were fully realized; and although the government has not even yet taken hold of the subject after the thorough French and Prussian style, school after school has been established, with the aid government grants, and private, municipal, and society bounty, in various cities of England, Scotland, and Ireland. Many of the schools are of low grade, designed to furnish teachers for the industrial, ragged, and reformatory schools, while others are for the improvement of the ordinary primary school.

The history of many of these schools is full of interest; but as they have no important features different from those of the countries already considered, and as the normal schools of Great Britain are, as a class, still in a very loose and unsystematized condition, I do not feel warranted by the plan and necessary limits, in space, of this report, in according to them more than this mere mention.

UNITED STATES.

Normal-school instruction in America, though late in getting recognition and adoption as a necessary means of improving the quality of the common schools, has, in recent years, received much attention and a steady development. The question of the establishment of normal schools began as long ago as 1816; the honor of the first public advocacy of their importance belonging to Denison Olmsted, afterward for many years, and up to the time of his death, a distinguished professor in Yale College. But the movement then begun did not culminate in the actual establishment of such an institution until 1839, when, under the stimulus of a conditional offer of $10,000 by Mr. Edmund Dwight, of Massachusetts, legislative measures were taken by that State for the immedi-

ate opening of a normal school at Framingham. In pursuance of this action, the first normal school of America was opened at that place on the 3d of July, 1839. Soon afterward two others were established by this same State, whose present number is four. From that center the influence extended itself outward in every direction until now nearly every Northern, two of the Southern, and one of the Pacific States, together with Prince Edward Island, New Brunswick, Nova Scotia, and both East and West Canada, are supplied with at least one normal school each; while in several of those States and provinces, as will appear by the enumeration already made, the number is two, three, and four.

Nor is this all. The movement is a progressive one, every day awakening fresh enthusiasm and gaining new strength. It is an essential part of the scheme of universal education, and is bound to go on until every State of the Union is provided with well-endowed, ably-officered, and thoroughly-managed normal schools, sufficient in number to educate all the teachers required for their numerous public schools. Already several of the States have made liberal provision for the successive establishment of schools in such number, by appropriations of money to be made from time to time as the condition of the public finances shall warrant and the hearts of wealthy citizens may prompt; and others have consecrated the proceeds of various grants of land to this object.

New York, Pennsylvania, and Wisconsin—and doubtless others with whose movements I may be less familiar—are notable examples of this anticipatory action. In the State last named, for instance, the legislature has set apart a percentage of the proceeds of certain "swamp and overflowed lands," granted to the State by the general government as an endowment for such number of normal schools as it may be thought judicious to establish. Such proceeds already amount to $602,791 50, and the amount is annually increased by the further sale of lands; the expectation being that it will ultimately—after the disposal of the seven hundred thousand acres of lands yet unsold—equal a sum scarcely less than $1,500,000. Upon this magnificent basis the normal school board has projected a plan for the establishment of six distinct normal schools, so located as to meet the wants of all portions of the State. Two of this number have already been established and are in successful operation, and active measures are in progress for adding the others as fast as the increasing fund will warrant. The plan adopted for location has been, after determining that one shall be placed in each of the six congressional districts, to invite offers or propositions from such towns and cities as may desire to secure the proposed institution; and it is highly creditable to the enterprise and intelligence of the various communities embraced that the competition has, thus far, been sufficiently active to insure the most desirable sites, together with funds sufficient for the erection and furnishing of elegant buildings, independent of appropriations from the normal-school fund.

On the subject of organization and efficiency of management, I am glad to be able to speak of American normal schools in terms of high commendation—more especially glad for the reason that in the case of almost all other classes of schools the comparisons made have been necessarily unfavorable to this country. To say the very least of them, they constitute a noble beginning of a most important work. Without those stringent and compulsory regulations which characterize the public instruction of the most advanced European countries, the regulations that govern the admission and thorough qualification of pupils are necessarily less rigid and effective here than in such foreign states; but this is the fault of our too lax and inefficient laws, and not of the normal schools, which, for material equipment and ability and spirit of instructional force, are quite in advance of any other class of our schools, and deserving of honorable mention in comparison with those of the same class abroad.

In one important respect our normal schools are an improvement on the best of those in Europe—they recognize the peculiar genius and fitness of women for the work of the teacher, their equal claims upon the state for the opportunity to qualify themselves for the responsible duties of that sacred office, and the entire practicability, and even the advantage, of their co-education with candidates of the other sex in the same professional school.

The model school, as an appendage to the normal school proper, is here, as in foreign countries, an invariable rule.

The term of study is usually three years, though certificates of actual attendance and proficiency in studies pursued for a shorter period are also granted. Tuition is free, but pupils board—usually in private families of the town—at their own expense.

From among the twenty-seven schools of the United States, the Normal University of Illinois may be taken as an illustration of the class. This institution, located at Bloomington, has been in operation about six years. Its pecuniary basis is the university fund, it being the only department that has hitherto been established. The handsome grounds and magnificent buildings, which are among the finest school buildings in the country, are mainly the gift of the locality. The means of illustration, especially in the department of the natural history of Illinois, are good; the library affords facilities for the profitable study, during leisure moments, of branches of learning collateral to the professional course; and the gymnasium, for systematic physical exercise under a professional leader, together with the general régime of the school, affords a good guarantee of bodily health for the pupils, and their appreciation of gymnastics as a branch of study that should be introduced in all the schools of the country. The term of study is the usual one of three years. The course of instruction, with the total number of weeks devoted to each study during the whole period, embraces the following subjects: metaphysics, (15 weeks;) history and methods of education, (51

weeks;) Constitution of the United States, and of Illinois, (13 weeks;) school laws of Illinois, (12 weeks;) English language, (93 weeks;) arithmetic, (28 weeks;) algebra, (12 weeks;) geometry, (28 weeks;) natural philosophy, (15 weeks;) book-keeping, (12 weeks;) geography, (40 weeks;) history, (28 weeks;) astronomy, (13 weeks;) chemistry, (13 weeks;) botany, (12 weeks;) physiology, (15 weeks;) geology, (12 weeks;) vocal music, (120 weeks;) writing and drawing, (120 weeks.) There is also an optional course of study for those who wish to qualify themselves for the charge of the higher class of public schools, embracing, Latin language, (80 weeks;) algebra, (15 weeks;) higher mathematics, (25 weeks.)

These several subjects are taught by five professors, and a preceptress and instructress in grammar and drawing—the professorships being so arranged as to gather the studies into the following groups, to wit: mental science and didactics; geography and history; natural science; mathematics; language.

Candidates for admission to this school are required—

1. To be, if males, not less than seventeen, and if females, not less than sixteen, years of age.

2. To produce a certificate of good moral character, signed by some responsible person.

3. To sign a declaration of their intention to devote themselves to school-teaching in Illinois.

4. To pass a satisfactory examination, before the county school superintendents of the counties where they reside, in reading, spelling, writing, arithmetic, geography, and elements of English grammar.

The necessary expenses, exclusive of pocket-money, are estimated at from $97 to $188 per annum for each pupil. Text-books are furnished by the institution free of expense, the pupils being required to make good all damages done to them while in their possession.

The model school embraces four departments, corresponding to those which constitute a complete system of city graded schools, to wit, a primary department, an intermediate department, a grammar school, and a high school, the number of principals and assistant teachers employed being nine. The high-school department of this model school has a four years' course of study, embracing two sections or courses, general and classical, and is quite equal in the range of its studies to the academical course in most of our American colleges.

The total number of normal pupils annually in attendance upon this excellent institution is usually about three hundred; the number of model-school pupils, about five hundred.

It is easy to see that the influence of even one such normal school in each State must tell with great effect upon the whole department of public instruction; what, then, may we not hope when the number of them shall have been so increased and the laws regulating the licensing and the employment of teachers so amended that no country school,

however obscure, shall be without its carefully-chosen and professionally-trained teacher?

But if we had all this now, there would still be one very important lack. We are engaged in establishing a great number of scientific and technical schools, which, when once fairly founded and equipped on the basis of national, State, municipal, and private donations at present secured and in progress of acquirement, will constitute the most magnificent array of schools of the scientific professions possessed by any nation of the world. But the fact is notorious that we are at present without suitably qualified teachers for this class of schools. The department is to our educated men a new one, and but few of them are now, or will be, prepared to do the work it demands. The success of such institutions depends more upon the qualifications of their professors than upon all other circumstances combined; and success should not be hazarded by the employment of incompetent men. What, then, is to be done? Imported teachers would not answer our purpose; nor can our young men who aspire to the post of professor in these schools afford to travel the world over and spend a lifetime in gathering up the requisite knowledge and acquiring the proper professional skill in foreign lands. It seems to me clear, therefore, that we especially need, no less than France, a national superior normal school. And, inasmuch as still other classes of our superior and special schools are only one degree less needy in this regard, I would make such national school broad enough and comprehensive enough to meet the demands of all.

The early establishment of such an institution would be rendered easy, if the national government would carry but a single step further its enlightened and liberal policy of making the unoccupied public domain subserve the highest uses of civilization; and I can think of no further application of that policy that would promise the accomplishment of more good, or that would be more universally approved by the great body of our intelligent people.

UNIVERSITY EDUCATION.

CHAPTER XII.

PRESENT CONDITION OF UNIVERSITY EDUCATION.

INTRODUCTION—THE ORIGINAL APPLICATION OF THE TERM UNIVERSITY—THE MODERN IDEA OF THE UNIVERSITY—UNIVERSITY EDUCATION IN FRANCE—ITALY—BRITISH UNIVERSITIES—SPANISH AND PORTUGUESE—GERMAN UNIVERSITIES—UNIVERSITY OF WURTEMBERG, HEIDELBERG, GIESSEN, JENA, LEIPSIC—SWISS UNIVERSITIES—UNIVERSITY EDUCATION IN HOLLAND—BELGIUM—SCANDINAVIAN UNIVERSITIES—RUSSIAN—UNIVERSITY EDUCATION IN AMERICA—HARVARD COLLEGE—YALE COLLEGE—COLUMBIA COLLEGE—OTHER UNIVERSITY ORGANIZATIONS IN THE UNITED STATES—THE CORNELL UNIVERSITY.

INTRODUCTION.

The original application of the term university was to associations of tradesmen in the time of the Emperor Justinian, the idea involved being that of a union of all or nearly all the individual members of a given craft or profession who were found in a particular locality; and such continued to be its sole application for several hundred years, until even the eleventh and twelfth centuries, when, in like manner, it began to be used as a designation for certain great schools of learning, since which date the university as an educational institution has assumed so many different types that even at the present time there is no little confusion and doubt in the public mind as to the precise class of institutions to which it properly applies. Thus, at the outset, the University of Bologna was a great professional school, embracing numerous associations of doctors and students devoted to the study of law; and Paris presented a parallel in the great school of theology and the scholastic philosophy, while the two English universities at Cambridge and Oxford were first distinguished as schools of philosophy and the arts.

The university of this period had no essential reference to the nature and number of the departments of study embraced, and it was not until long after the foundation of the so-called universities above named that the several schools or faculties now embraced were successively established. They were simply groupings of learned doctors and aspiring scholars animated by a common desire to acquire and diffuse the most popular knowledge of the times—a *universitas doctorum et scholarium*. But slowly the idea of forming therein a complete circle of higher culture and knowledge of every sort, represented to the eye of the public

not alone by its scholarly professors, but also by various material aids to instruction, such as libraries and collections, found place here and there, and the university took the form of the *universitas literarum et scientiarum*, embracing schools of letters; of language, literature, and philosophy; schools of science; and schools of the everywhere-recognized professions of law, medicine, and theology.

This is the signification the term still carries in the most learned communities of the present day, notwithstanding certain exceptional uses, as in the case of the University of New York and the University of London, and the gross misapplications of it so common in our own and in some other countries.

Omitting all consideration of the various steps by which this idea of the university was at last reached, as well as of the many striking peculiarities that characterized the leading universities of the past, it is my purpose, in this place, to present, as gathered from recent personal observations and inquiries in nearly all countries where the university of any type whatever exists and from official documents of latest date, first, the present actual condition of university education; and, secondly, some of its more manifest tendencies.

UNIVERSITY EDUCATION IN FRANCE.

As already stated in the foregoing chapters, France no longer has a nominal university, either at Paris, seat of the first university so-called, or elsewhere within her boundaries. But practically the institution exists just as veritably as at any period since the revolution; for, strictly speaking, the University of France, created by Napoleon I in 1808, and finally abolished, or rather superseded, by the organic law of March 15, 1850, was only a supervisory corporation, with authority to regulate the "academies," which were the only universities during the First Empire, the Restoration, and the period of the Orleans dynasty, as well as subsequently, and which, through all the changes of the past sixty years, have substantially maintained the same educational character.

Many of these academies fall short of the university standard of Germany, which denies to any institution the rank of "full university" that does not embrace the four faculties, namely, of the arts, (*philosophische Facultät*,) of theology, of medicine, and of law, for several of them include but two or three of the faculties; but in this respect they are scarcely inferior to a number of the acknowledged universities of other European countries; while almost any of them are quite superior to a majority of the institutions that claim the university title in the United States. I deem it proper, therefore, to ignore the exceptional title of the French academies, and to treat them as being what they really are, incomplete universities—a designation no less truly, though in different degrees, applicable to even the highest in rank in those countries where the university has been regarded as being very complete indeed.

Exclusive of the one in Savoy and the one in Algiers, or, in other

words, in France proper, there are, as elsewhere remarked, sixteen academies, each constituting the educational center of an academy district and embracing several departments of the empire.

The affairs of each academy, including all superior and secondary institutions of the district properly subordinate to the minister of public instruction, are managed by an academic council consisting of the rector, as president; the academy inspectors, of which there is one for each department embraced in the district, except at Paris, where the number is eight; the heads of faculties, known as deans; and seven additional members appointed triennially by the minister, and including an archbishop or bishop of the district, two ministers of the Catholic, Protestant, or Jewish church, two magisterial officers, and two public functionaries or other notable persons of the district.

The rectors are chosen by the Emperor. The faculty professors are also selected by him on the proposal of the minister and can only be dismissed by imperial order. The deans of faculties are chosen by the minister from among the professors over whom they are to preside. But neither the Emperor nor the minister can make nominations or appointments of rectors, deans, or professors independent of the organic law governing public instruction, which establishes various important conditions and tests to be fully met by all aspirants alike.

In the first place, no one can be appointed a rector or dean who is not possessed of the qualifications of a full professor; and no one can attain to the professoriate unless thirty years of age and professor of the doctorate in the faculty to a place in which he aspires, nor even then unless he has been first examined in a most thorough manner in the branches he proposes to teach and has actually served for some time as assistant professor.

Besides the full professors (styled *professeurs titulaires*) the faculties often include assistant or acting professors (*professeurs suppléants*,) honorary professors, and certificated teachers known as *professeurs agrégés*.

The *professeur suppléant* is chosen by the minister from *agrégés de faculte*, or from persons of proved ability possessed of the doctorate in the department of learning, whose faculty is to be supplied. This post of *suppléant* or adjunct is often filled by doctors of marked ability and superior attainments, in all respects competent to the duties of the *professeur titulaire*, and only holding the subordinate position, as army officers do, for want of vacancies in the places of higher grade.

The *agrégés de faculté* are persons duly authorized to teach either independently, (in which case they are called *agrégés libres*,) or in the faculty proper, should the exigencies of the service require it, in which case they are known as *agrégés* in practice.

It will, of course, be understood that the title of *agrégé* does not carry with it authority to teach in any one of the faculties at pleasure, but only in a particular faculty; nor yet in any department of a particular faculty, but only in a specific department, fitness for which has been

demonstrated in a competitive examination upon the branches included in such department. Nevertheless, there are certain general conditions or prerequisites to admission to the examinations which are common to every class of candidates for aggregation. Thus every candidate must be not less than twenty-five years of age, a native of France or a naturalized citizen, and possessed of the diploma of doctor in the particular faculty for aggregation in which he is an applicant. It is likewise demanded of all that they inscribe their names as candidates with the secretaries of the academies in their respective districts at least two months in advance of the time fixed by the minister for the examinations. There is also a certain agreement in the general character of the examinations to which all classes of candidates for aggregation are subjected, namely, in that the tests are invariably of two kinds—first, the preparatory, and, secondly, the definitive tests; though the details of said tests vary according to the nature of the service to which they are designed to admit the applicant.

FACULTY OF LETTERS.

Agrégés of the faculty of letters are certificated for ten years, and renewed by halves every five years; but they may be maintained in their rank as such or in their functions after the expiration of the time of legal exercise, or even be recalled into active exercise, should the needs of the service require it. They are divided into three sections, to wit: first, the section of ancient and modern literature; secondly, the section of philosophy; and, thirdly, the section of history and geography. The preparatory tests consist, first, in the settlement of the candidate's general qualifications and title to admission to the further tests; and, secondly, in two written compositions—one in Latin, upon a subject belonging to ancient literature, the other in French, and upon a subject of modern literature, history, or philosophy, according to the section in which aggregation is desired. Having satisfactorily passed the preparatory tests the candidate is admitted to such as are considered definitive, and which for this particular faculty consist of an argumentation and two oral lessons. The argumentation bears, for the first section, (literature, ancient and modern,) upon the grammatical and literary construction of Greek, Latin, and French texts, and, if the candidates desire it, upon texts taken from foreign literatures; for the second section, (philosophy,) upon the literary and philosophic interpretation of some of the principal works of Greek, Latin, and French philosophy; for the third section, (history and geography,) upon the literary and historic interpretation of some of the principal works of Grecian, Latin, and French history. The two lessons are given by the candidate as to a class, and pertain in like manner to the subjects embraced in the section in which the prospective *agrégé* intends to teach.

FACULTY OF SCIENCES.

Agrégés of the faculty of the sciences are certificated for a like period and the authority granted them is renewable in like manner. They are

likewise divided into three sections: first, the section of the mathematical sciences, pure and applied; secondly, the section of physical sciences; and, thirdly, the section of the natural sciences. The preparatory tests in this case consist, first, in a verification of the candidate's general qualifications, as established by the diploma of doctor and other documentary evidences; and, secondly, a composition upon a subject belonging to the order of instruction for which the candidate is inscribed. The final or definitive tests consist of an oral lesson and a written argumentation. The argument consists of a thesis upon some one of the subjects announced in the official programme of the examinations six months in advance. The oral lessons, to be given by the candidates as to a class, are, for the mathematical section, upon mathematical analysis, mechanics, or astronomy, at the option of the candidate; for the physical section, upon physics or chemistry; for the natural science section, upon some branch of natural history.

FACULTY OF LAW.

Agrégés of the faculty of law also regularly enjoy the title, and exercise the functions appertaining, for the period of ten years, and the conditions of a renewal or extension there are the same as in the faculties of letters and science. They are also divided into three sections, namely: first, of Roman law; secondly, of civil and criminal law; and, thirdly, of administrative and commercial law. The preparatory tests are three: first, the verification of the qualifications for admission to the examinations prerequisite to the title; secondly, a written and printed dissertation on Roman law; thirdly, a lecture belonging to the order of instruction for which the candidate is inscribed. The definitive proofs consist of two oral lessons and two argumentations. Of the two lectures, one bears upon the Code Napoléon, the other relates to the particular order of instruction for which the candidate is inscribed. Of the two argumentations, one must be upon a title of the digest, and the other upon a subject drawn from the particular order of legal instruction for which the candidate is inscribed.

FACULTY OF MEDICINE.

Agrégés of the medical faculty do not enter actively upon the performance of their functions until after the expiration of three years from the date of admission. The duration of their functions when admitted to take part in the examination of students and to replace professors is six years for the faculty, at Paris, and nine years for the faculties at Montpelier and Strasbourg. Every three years the *agrégés* in practice are renewed; by halves in the faculty of Paris, by thirds in the other two faculties. They are divided into four sections: first, for the anatomical and physiological sciences, including anatomy, physiology, and natural history; secondly, for the physical sciences, including physics, chemistry, pharmacy and toxicology; thirdly, for medicine properly so called and for medical jurisprudence; and, fourthly, for surgery and obstetrics. The

preparatory tests are, first, the usual determination of preliminary qualifications; secondly, a dissertation upon an anatomical and physiological question; thirdly, a lecture upon some subject belonging to the section for aggregation in which the applicant is candidate. The final tests consist of a lecture, practical proofs, and an argumentation. The lecture is given upon a subject belonging to the order of instruction for which the candidate is inscribed. The nature and number of the practical tests imposed upon each candidate are determined by the president, after consultation with the members of the jury of examiners. The argument required is embodied in a thesis upon some subject belonging to the section in which aggregation is sought by the candidate.

FACULTY OF THEOLOGY.

In the faculties of theology the instruction is exclusively given by professors and adjunct professors, who for the Catholic faculties are named by the Emperor, upon the proposition of the minister of public instruction and the presentation of the archbishop or bishop of the diocese, and for the Protestant faculties upon the presentation of the religious authority, after the votes of the consistories collected by the central council.

SCHOOLS OF PHARMACY.

In the superior schools of pharmacy, which are branches of the three medical faculties, the conditions to be complied with, in order to gain admission to the rank of *professeur titulaire*, *professeur suppléant*, or *agrégé*, are quite identical with those already named; thirty years of age, the possession of the degree of doctor in the physical sciences, and the diploma of *pharmacien* of the first class, and the having for two years given a course of instruction analogous to those given in the superior schools of pharmacy being essential to admission to the examinations prescribed for the professoriate, and twenty-five years of age and the possession of a diploma of doctor in the physical or natural sciences, and that of *pharmacien* of the first class, essential to admission to the examinations for aggregation. The professors are named by the Emperor upon the proposition of the minister, who chooses them either from among the candidates provided with the qualifications above named, or from the members of the Institute of France, or upon a double presentation made by the school in which the vacancies exist and by the academic council. The *agrégés* are required to undergo a series of most thorough examinations. There are, also, in the schools of pharmacy, adjunct *professeurs*, who are required to be twenty-five years of age, and to have the degree of licentiate in the physical sciences, and the diploma of *pharmacien* of the first class, and who are named by the minister.

NUMBER OF PROFESSORS AND INSTRUCTORS.

I have been thus particular in detailing the manner in which instructors are obtained for the universities of France, in order that it may again appear how exceedingly careful the French government is to insure

to the highest institutions of learning a correspondingly high grade of qualifications. It remains but to add that the compensation accorded does equal honor to the intelligence and liberal spirit of the government. In Paris, the salary of a full professor, as well as of the academic inspector, is 12,000 francs, an amount fully equal, relatively, to $4,000 in the United States. Besides which, the professor, being occupied but for a few hours a week, and free to employ his leisure time in any manner that suits his convenience, may, if he desires to do so, add to this income from other sources. But the French professors are students, and seldom go out of their legitimate field.

The result of this policy appears in the fact that the French professors are not only among the very ablest in the world, but are held in the highest honor by both people and government.

A complete academy embraces the following faculties: a faculty of sciences, a faculty of letters, a faculty of theology, a faculty of law, and a faculty of medicine. But the only ones including all these five faculties are those of Paris and Strasbourg. The faculties of letters and science are found in all, faculties of theology in six, faculties of law in eleven, faculties of medicine in three.

The number of chairs and the titles of professorships are different in the various academies, scarcely any two agreeing perfectly in these respects.

Thus the Academy of Paris has a faculty of theology with seven full professors and two *suppléants;* a faculty of law, with nineteen full professors and six *agrégés;* a faculty of medicine, with twenty-five full professors, three *suppléants*, five honorary professors, two *agrégés* in charge of complementary courses, and twenty-two *agrégés en exercise*, together with a branch superior school of pharmacy, including nine professors, one *suppléant*, and seven *agrégés;* a faculty of science, with seventeen full professors, four *suppléants*, two honorary professors, and three *agrégés;* and a faculty of letters, with eleven full professors, four *suppléants*, one professor in charge of a complementary course, three honorary professors, and nine *agrégés.*

The Academy of Aix has a faculty of science, with six professors and six *agrégés* in charge of complementary courses; a faculty of letters, with five professors and one complementary *agrégé;* a faculty of law, with nine professors and three *agrégés;* and a faculty of theology, with five professors.

The Academy of Besançon has a faculty of sciences, with six professors, and a faculty of letters, with five professors.

The Academy of Bordeaux has a faculty of sciences, with six professors; a faculty of letters, with five professors; and a faculty of theology, with six professors.

The Academy of Caen has a faculty of letters, with five professors; a faculty of sciences, with five professors and one complementary; and a faculty of law, with seven professors and one *agrégé.*

The Academy of Clermont has a faculty of the sciences, with four full professors and two *suppléants*, and a faculty of letters, with five professors and one *suppléant*.

The Academy of Dijon has a faculty of science, with five professors; one of letters, with five professors; and one of law, with seven professors and two *agérgés*.

The Academy of Douai has a faculty of sciences, with seven regular chairs and two complementary courses; a faculty of letters, with five professors; and a faculty of law, with eight professors and two *agrégés*.

The Academy of Grenoble has faculties of the sciences and of letters, with five professors each, and a faculty of law, with eight professors, two complementaries, and two *agrégés*.

The Academy of Lyons includes a faculty of letters, with five professors, one of the sciences, with seven, and one of theology, with six.

The Academy of Montpellier has a faculty of letters, with six professors; a faculty of the sciences, with eight professors; and a faculty of medicine, with seventeen professors, two complementaries, and thirteen *agrégés*.

The Academy of Nancy has a faculty of letters, with five professors, one of science with four regular chairs and one complementary course, and a faculty of law, with seven professors and three complementaries.

The Academy of Poitiers embraces a faculty of letters, with five chairs, one of the sciences, with four, and one of law, with ten professors and two *agrégés*.

The Academy of Rennes has a faculty of letters, with five professors, one of the sciences, with four, and one of law, with seven professors and four *agrégés*.

The Academy of Strasbourg, as before remarked, includes all the faculties, to wit: one of letters, with five professors; one of the sciences, with six; a faculty of medicine, with seventeen professors, two *agrégés* in charge of complementary courses, and sixteen *agrégés en exercise;* a faculty of law, with ten professors, and a faculty of theology, with six professors.

And the Academy of Toulouse embraces a faculty of letters, with five professors; a faculty of the sciences, with eight professors; a faculty of law, with eleven professors and three complementaries; and a faculty of theology authorized but not yet organized.

There is, also, subject to the academic council of Caen, a faculty of theology, with five professors, at Rouen, which makes the whole number of faculties of theology seven.

The subjects giving title to the professorships in the faculties having the minimum number of professors are substantially as follows:

In faculties of letters: philosophy, French literature, ancient literature, foreign literature, history.

In faculties of the sciences: pure mathematics, astronomy, and rational mechanics; botany, geology, and mineralogy; physics, chemistry.

In faculties of medicine: anatomy, physiology; medical chemistry and pharmacy; botany and medical natural history; hygiene; operations and apparatus; medical pathology; surgical pathology; materia medica and therapeutics; general and medical chemistry and toxicology; pathology and general therapeutics; medical jurisprudence; obstetrics and diseases of women and children; surgical clinic; medical clinic, together with various complementary courses, usually upon special diseases or classes of disease.

In faculties of law: Roman law; the Code Napoléon; civil procedure and criminal legislation; commercial law; administrative law.

In faculties of theology: dogmatic theology; Christian morals; Hebrew language; ecclesiastical history and discipline; the Bible; sacred eloquence.

The titles of the eighty-eight chairs embraced in the five faculties and superior school of pharmacy of the great Academy of Paris, with its eighty-eight full professors, ten *suppléants*, ten honorary professors, and fifty *professeurs agrégés*, have been already given in the chapters on schools of letters, science, medicine, law, and theology, respectively, and need not be repeated in this connection. But one or two universities in the world present a greater number of important chairs of instruction, and none a more brilliant array of distinguished savans composing its professional corps. One advantage is lost to this association of university faculties by reason of the diversity of their locations. The faculties of letters, science, and theology are located at the Sorbonne, but the other faculties are scattered, that of medicine being found in the *Place de l'École-de-Medecine*, the faculty of law in the *Place du Panthéon*, and the school of pharmacy in the *Rue de l'Arbalète*.

ADMISSION, DEGREES, NUMBER OF STUDENTS.

Admission to the courses of instruction offered by the French faculties requires a degree of educational qualifications about equal to that demanded for admission to most European universities. For admission to the faculties of letters and science, the candidate must be possessed of such qualifications as are attainable at the *lycées*, such as are represented by the diploma of bachelor granted by a majority of our American colleges. Admission to the faculties of law and theology requires the possession of the diploma of bachelor of letters; to those of medicine and to the superior schools of pharmacy, the diploma of bachelor of science.

The degrees conferred by all the faculties are those of bachelor, licentiate, (equivalent to our master,) and doctor. They are conferred in no case without thorough examinations of the candidate, and they must be taken in order; possession of the lower degree being a prerequisite to admission to the examinations necessary to the next higher degree. In the faculties of letters and science the lowest degree is conferred upon examination merely, without reference to the term of study. But the

privilege of examination for the doctorate in none of the professional faculties can be accorded unless the candidate can show that he has spent at least the equivalent of four years of study in a faculty of that order. I say *equivalent* because examinations for the doctorate in medicine are allowable where the candidate has spent three and a half years in an *école préparatoire de médicine* and one year in a faculty; and in theology where the candidate has spent three years in a theological seminary and taken four inscriptions in a faculty of theology.

The students in attendance upon the French faculties board where they choose, and only visit the place of instruction to listen to the lectures or to engage in such practical exercises as properly belong to their respective courses of study.

The expense of a full course of study requisite to the degree of bachelor—tuition, examinations, and diploma included—is about 600 francs; to the degree of doctor, about 1,300 francs.

The support of the faculties is derived in part from these fees paid by the students, and in part from the state, which annually appropriates large sums for this purpose. Last year (1867) their share in the annual budget for public instruction amounted to 3,828,821 francs.

The total number of students in annual attendance upon the 48 faculties embraced in the 16 French universities is about 24,000, or one for every 1,900 inhabitants. The average number per academy, therefore, is no less than 1,500; per faculty, 500. The actual distribution, however, is very different from this average; for scarcely less than between 14,000 and 15,000 of the whole number are found in the great faculties of Paris, thus reducing the average for the 15 country academies to about 640 students.

The distribution by faculties of the students at Paris—assuming the whole number to be 14,500—is very nearly as follows:

Students of science, 100[1]; students of letters, 1,900; students of theology, 200; students of medicine, 4,300; students of law, 8,000.

In view of the foregoing facts and figures, we may reiterate the question, by what authority they assert it, who declare that in France the university is extinct.

THE UNIVERSITIES OF ITALY.

University education in Italy has long suffered, and is still suffering, from several causes, prominent among which are excess in number of the institutions of that class, the long-continued, illiberal domination of the church over the educational interests of the country, and a decline of the spirit and pride of nationality, consequent on the disintegration of the kingdom.

The last-named causes have, of late, been, in great measure, removed; but the political changes wrought since 1848 have not yet led to that

[1] The small number of students in the *faculté des sciences* is accounted for by the relatively large number attracted to those great scientific centers, the *Collége de France* and the *Muséum d'Histoire Naturelle.*

consolidation and reorganization of the universities, without which high character and efficiency are impossible.

From the foundation of the University of Genoa, in 1812, to the conclusion of the Prusso-Austrian war of 1866, which restored the province of Venetia, and, as a matter of course, replaced the ancient and once famous University of Padua among its old associates, the number of Italian universities was 19; of which 16, those of Bologna, Cagliari, Catania, Genoa, Macerata, Messina, Modena, Naples, Palermo, Parona, Pavia, Pisa, Sassari, Sienna, and Turin were and are still institutions of the state; while those of Camerino, Ferrara, Perugia, and Urbino are free or independent. The recovery of Padua, therefore, raises the number of royal institutions to 16, and the whole number to 20. There are also institutions at Rome and Florence, which, including, as they do, a portion of the teaching given in the university faculties, are sometimes ranked as universities. Admitting these, the number would be 22. But, as they are in no proper sense universities, and are not so treated by the government, there seems to be no propriety in their inclusion.

MAINTENANCE OF ROYAL UNIVERSITIES.

The royal universities are sustained by a fund derived in part from the rent of property originally their own by inheritance but now managed by the state, in part from the fees paid by students, and in part from appropriations made by the government. But in few cases do the rents and the fees together constitute more than about one-half the whole cost of maintenance, and in most a much less percentage than that. Formerly the property of the universities was managed by the institutions themselves; but, at present, the revenues of every sort are paid into the treasury of the state, which assumes the responsibility of making up all deficiencies however great.

Thus the total cost of maintaining the government universities at the present time is no less than 5,500,000 francs per annum; while the total revenue from their several properties is considerably less than 1,000,000 francs, and the total of fees paid by students but little more than 500,000 francs. Stating the amount in round numbers, therefore, it may be said that the fifteen royal universities of Italy are an annual expense to the government of some 4,000,000 francs, or more than four times the cost to the French government of maintaining the faculties of Paris and of the departments. The amount actually expended upon the French faculties is about 3,500,000 francs per annum; but so large an amount comes back in the form of fees that less than 1,000,000 francs is actually drawn from the state.

As a convenient method of stating this matter of cost and sources of revenue more in detail, I present the following table, the material for which has been derived in part from the officers of such of the universities as I was enabled to visit, and in part from the very able report of Signor Matteucci. (*Sulle Condizioni della Publica Istruzione nel Regno d'Italia*, 1865.)

Table showing the sources of their revenue and the total annual expenses of Italian universities.

Universities, royal and free.	Income from university property.	Income from tuition fees.	Deficiency supplied by the State.	Total expenses per annum.
ROYAL UNIVERSITIES.	*Francs.*	*Francs.*	*Francs.*	*Francs.*
Bologna	15, 000. 00	26, 000	454, 574. 12	495, 574. 12
Cagliari	.....	4, 439	.....	155, 772. 00
Catania	75, 000. 00	29, 480	87, 466. 63	191, 946. 63
Genoa	(*)	20, 000	234, 667. 00	254, 667. 00
Macerata	(*)	4, 000	.....	.....
Messina	25, 681. 56	8, 766	85, 732. 21	120, 179. 77
Modena	(*)	31, 784	.....	217, 389. 72
Naples	(*)	160, 000	.....	678, 976. 84
Palermo	144, 138. 46	21, 382	258, 952. 91	424, 473. 37
Parma	(*)	21, 000	.....	193, 485. 35
Pavia	10, 500. 00	83, 984	298, 773. 28	392, 767. 28
Pisa	88, 200. 00	50, 000	292, 147. 47	430, 347. 47
Sassari	(*)	4, 500	.....	53, 996. 00
Sienna	48, 782. 52	8, 000	64, 968. 98	121, 951. 50
Turin	.....	71, 730	.....	619, 881. 00
FREE UNIVERSITIES.				
Camerino	35, 469. 23	2, 745	.....	(*)
Ferrara	36, 351. 00	8, 500	.....	(*)
Perugia	46, 664. 00	5, 100	.....	(*)
Urbino	67, 201. 00	3, 000	.....	(*)

* Amount not definitely ascertained.

The distribution of the several sums total above given, in the year 1865, was as follows:

Table showing the distribution of the several sums total in the year 1865.

Name of university.	Personal direction, instruction, and other service.	The secretariat, service, and material.	Scientific establishments belonging to the universities.	Buildings and repairs.	Extraordinary expenses.	Incidentals.	Total expenses.
	Francs.	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*	*Francs.*
Bologna	304, 900. 00	21, 872. 96	135, 113. 00	7, 300. 00	18, 000	8, 388. 16	495, 574. 12
Cagliari	99, 550. 00	8, 900. 00	35, 022. 00	1, 200. 00	8, 500	2, 600. 00	155, 772. 00
Catania	129, 620. 00	14, 485. 00	37, 260. 00	2, 200. 00	5, 000	3, 381. 63	191, 946, 63
Genoa	144, 425. 00	18, 000. 00	71, 092. 00	3, 550. 00	17, 000	600. 00	254, 667. 00
Messina	95, 160. 00	9, 965. 00	13, 354. 77	1, 500. 00	.....	200. 00	120, 179. 77
Modena	134, 410. 72	11, 890. 00	65, 293. 00	1, 200. 00	3, 096	1, 500. 00	217, 389. 72
Naples	343, 400. 00	37, 800. 00	243, 776. 84	18, 000. 00	28, 000	8, 000. 00	678, 976. 84
Palermo	276, 150. 00	21, 446. 00	85, 078. 00	4, 449. 37	35, 000	2, 300. 00	424, 473. 37
Parma	126, 810. 00	12, 350. 00	49, 560. 00	1, 500. 00	2, 000	1, 265. 35	193, 485. 35
Pisa	293, 743. 27	18, 700. 00	88, 991. 40	8, 090. 00	18, 000	2, 822. 80	430, 347. 47
Sassari	37, 050. 00	5, 946. 00	9, 400. 00	700. 00	.....	900. 00	53, 996. 00
Sienna	87, 581. 00	7, 720. 50	23, 502. 00	1, 554. 00	.....	1, 594. 00	121, 951. 50
Turin	311, 000. 00	31, 160. 00	212, 200. 00	20, 300. 00	36. 521	8, 700. 00	619, 881. 00

FACULTIES OF THE UNIVERSITIES.

The faculties embraced in what, in Italy, is regarded as a complete university are those of theology, law, medicine and surgery, science and

letters;[1] in which respect there is a perfect accordance with the plan of division in France, although the whole five faculties are found together in none of the French universities except those at Paris and Strasbourg.

The sixteen royal universities embrace sixty-three faculties; which comes within a small fraction, it will be observed, of an average of four faculties per university. Those embracing the five faculties are the universities of Cagliari, Catania, Genoa, Padua, Palermo, Pisa, and Turin. The universities embracing four faculties are those of Bologna, Messina, Naples, and Pavia. The royal universities of Modena and Parma and the free universities of Ferrara and Perugia include three faculties, while the royal university of Macerata, which scarcely deserves the title, and the free universities of Camerino and Urbino each embrace only two faculties; the first two those of law and medicine, and the last-named, those of law and science.

It should be remarked, however, that besides these full faculties there are several "courses" and "schools" connected with the universities of Italy, many of which are provided with large and able corps of instructors, entitling them to such importance that if they were established in connection with American universities they would rank as departments or colleges. Thus, Bologna, Perugia, and Urbino each include a course in veterinary science, *(corso di veterinaria,)* with twelve, six, fourteen, and thirteen professors respectively; Modena and Parma embrace courses in practical engineering, *(corso speciale per i praticanti ingegneri,)* with five and four professors each; Perugia includes a triennial course in the theory and practice of agriculture and of surveying; while Bologna, Cagliari, Macerata, Modena, Naples, Palermo, Parma, Pavia, Pisa, Sassari, Sienna, Turin, Ferrara, Perugia, and Urbino have each a regular school of pharmacy, with six to nine professors.

The principal officers in charge of the Italian universities and of their several faculties and scientific establishments are an administrative officer, usually styled the rector, but in some cases, as in those of Bologna and the free universities, designated as the regent; a secretary, with several assistants; a president at the head of each of the faculties embraced; and a director, with one or more assistants, in charge of each of the scientific establishments connected with the university. In many cases the regent or rector is favored with an advisory council, consisting of the presidents of the several faculties, and variously known as the council of the regency, the academic council, &c., and in a few cases there are also a vice-rector subordinate to the rector and deans of faculty, second in rank to the presidents.

The number of chairs of instruction in the 20 universities of the kingdom is 1,524; of which 61 belong to the faculties of theology; 307, to the faculties of jurisprudence; 495, to the faculties of medicine and surgery; 346, to the faculties of the physical, mathematical, and natural sciences; 154, to the faculties of philosophy and letters; 53, to the schools

[1] The newly recovered university constitutes an exception, however, substituting the faculties of mathematics and philosophy for those of science and letters.

of engineering and to the veterinary schools connected with the medical faculties; 97, to the schools of pharmacy; and 41, to the suppressed facultative schools *(scuole facultative)* of Piacenza, lately united with the University of Parma.

The instruction in the twenty Italian universities is given by some 1,400 professors and teachers of different grades; the largest number (230) being found in the University of Turin.

The professors are known as ordinary, extraordinary, *in caricati*, (professors extraordinary specially charged with courses of instruction,) substitutive, (professors of high qualifications, capable of assisting or relieving the regular or ordinary professors, and, in Italian, called *supplenti*,) *honorary*, and *emeritus* professors. There are likewise three classes of teachers, who, although they have not yet attained to the rank of professor, are found in greater or less number in the universities, and not unfrequently among the ablest members of the instructional corps, to wit: *assistant* professors, *(assistenti,) adjunct* professors, *(aggiunte,)* and private lecturers or *privat-docenten*, *(docenti privati.)*

The proportionate number of these respective classes of professors and teachers in both the royal and the free universities of Italy will be found concisely stated in the following table:

Statement of the number of faculties and special schools, courses, &c., with the number and character of the instructors in each, embraced in the several universities of Italy.

Universities.	Faculties proper	Schools and courses.	Professors of various grades.					
			Ordinary.	Extraordinary.	In caricati.	Honorary and emeritus.	Agrégés, (Aggregati.)	Total number instructors.
Bologna	4	2	46	5	1	3		109
Cagliari	5	4	24	6	6	7		80
Camerino	2	4	15	.....	15	6	14	50
Catania	5	2	23	8	.....	.....	1	32
Ferrara	3	1	6	13	4	9	.....	32
Genoa	5	1	37	5	1	5	66	114
Macerata	2	3	15	1	7	3	16	42
Messina	5	3	16	16	.....	.....	.....	32
Modena	4	3	35	2	.....	8	.....	45
Naples	4	.....	46	8	.....	23	.....	77
Padua	5	3	40	5	3	.....	9	57
Palermo	5	4	44	7	3	1	.....	55
Parma	5	3	34	4	8	50	.....	96
Pavia	4	1	40	4	3	2	.....	49
Perugia	3	5	27	.....	.....	8	8	43
Pisa	5	.....	47	.....	8	44	.....	99
Sassari	3	3	11	6	4	10	35	66
Sienna	2	2	24	1	.....	23	.....	48
Turin	5	1	50	19	2	28	131	230
Urbino	2	5	19	4	8	.....	8	39
	78	50	599	118	73	230	379	1,399

Touching the character of the faculty professors in Italy, their selection, service, and compensation, it may be remarked in general terms that at the present time they are hardly up to the French, and very decidedly below the German, standard; not in native ability, nor yet, perhaps, in scholarship; for very many of them are men of the first ability, and first also in social and civil life. But the universities and all connected with them have partaken of the educational spirit of the country, which, as before intimated, is sadly in need of an infusion of new energy and a higher ambition. Accordingly, instead of the zealous and laborious service performed by French and German professors who are accustomed to give from ninety to one hundred and twenty lectures each during the year, sixty or seventy is the maximum number; which, for the period embraced in the collegiate year, is less than two per week. While, therefore, the compensation allowed to a professor is small, it is not, after all, very disproportionate either to the compensation of men in other pursuits or to the amount of service actually rendered.

The law of 1862 fixed the salaries of professors in the smaller universities at $600 to $720; in the principal universities, at $1,000 to $1,200.

A noticeable fact in relation to the instructors is the small number, relatively, of private teachers in most of the universities in proportion to the number of ordinary professors—the exact reverse of what is so observable in the universities of Germany, and of that, wherever found, which indicates the highest degree of intellectual activity.

NUMBER OF STUDENTS.

The universities of Italy are, in the aggregate, far less numerously attended than those of France; the whole number of students in annual attendance scarcely exceeding ten thousand, or one student for about every two thousand two hundred inhabitants. And when it is understood that nearly one-half of this whole number must be set down to the credit of the university of Naples, at which the attendance ranges between three thousand and five thousand, it becomes apparent that the majority are but little frequented.

According to Signor Matteucci, there are in Italy but 4 universities that exceed 1,000 students, to wit: Naples, Turin, Pavia, and Padua. Of the remaining 16, 5 (Cagliari, Camerino, Macerata, Sassari, and Urbino) have less than 100 students, 4 (Ferrara, Messina, Perugia, and Sienna) have but little more than 100 and less than 200 each, and 7 (Pisa, Bologna, Modena, Genoa, Catania, Parma, and Palermo) number from 200 to 700 pupils each.

It needs to be borne in mind by the American reader, however, that the students in attendance upon the universities, as upon most of those in European countries, are advanced pupils, already possessed of such qualifications for the professional and other higher studies as are attainable at the royal lyceums and as are equivalent to those represented by a majority of American colleges.

University students in Italy are divided into students and auditors.

According to the royal decrees of 1862 and 1864, it is necessary, in order to be admitted to the university studies, to produce the certificate of *licenza liceale*, to undergo the examination for admission prescribed for the faculty to whose studies the applicant seeks admission, and to pay the prescribed price of inscription. Auditors, (*uditore*,) or such as attend upon the lectures and demonstrations of the professors without aiming at university degrees, must also produce the certificate of *licenza liceale* and pay one and a half times the regular fee, but are exempt from the preliminary examination.

The price of inscription varies somewhat for the different faculties, but is, in general terms, lower than in any other country of Europe, being only 38 to 102 francs per annum for all the studies which lead to a given diploma, or 155 to 410 francs for an entire course of three to six years. The highest fees are demanded by the faculties of jurisprudence, the lowest by the faculty of letters and philosophy, as will appear by the following tabular statement:

Fees for instruction from various faculties in Italy.

Faculty.	No. years of course.	Fees per annum.	Total fees for course.
		Francs.	*Francs.*
Letters and philosophy	4	38.75	155
Physical, mathematical, and natural sciences	4	60.00	240
Medicine and surgery	6	46.67	280
Jurisprudence	4	102.50	410
Theology	4	86.50	346

Poor students distinguished in their studies, as shown by the *certificato della licenza* and the preliminary examination, or by their standing at the university during the preceding year, are favored with a remission of fees; but the same is not true of the *uditore*, who are only admitted on payment of the fees.

In the preceding chapter mention was made of the great number of colleges established in connection with many of the Italian universities for the free support *in toto* of students needing aid. Some few of these interesting relics of the Middle Ages yet remain. But the *Collegio Ghislieri* and *Collegio Borromeo*, the former with sixty-six and the latter with twenty-eight full maintenances, are almost the only ones left. At Turin, however, in the university and in the *Collegio delle Provincie* there are nearly two hundred free supports provided for students. Still, the total amount annually expended by the state in this manner does not now exceed about $30,000.

As to the distribution of pupils among the different faculties, the most notable and important fact is the exceedingly small proportion of those

who devote themselves to the study of letters, science, and philosophy, especially of letters and philosophy, and the very large porportion who enter the faculties of medicine and jurisprudence. Indeed, the number of the former is almost too insignificant, in some of the universities, to demand mention. For example, in 1864 the University of Pavia, with a total of 1,204 students, had but eight in the faculty of letters; and at Bologna, where the total number of students in the four faculties of law, medicine, science, and letters was 489, but 33 were found in the last-named faculty. Turin is almost the only exception to this general rule.

Presented a little more in detail for a few of the universities, including some of the most and some of the least numerously attended, this peculiarity is illustrated by the following tabular statement of facts gleaned from the statistics of 1864 and 1867:

Table showing the number of faculties and the number of students.

University.	No. of faculties.	Whole No. students.	In faculty of law.	In faculty of medicine.	In faculty of sciences.	In remaining faculties.
Bologna	4	489	129	181	146	33
Genoa	5	238	87	48	37	66
Modena	4	466	185	77	120	84
Padua, 1867	5	1,440	633	410	362	33
Pavia, 1867	4	1,023	329	284	332	78
Turin	5	1,003	393	172	110	328

In some cases this neglect of the literary and philosophical studies, and this almost exclusive devotion to the professional ones—the *bread studies* as the Germans call them—is so entire that there have been years in which some of the universities have not conferred a single degree in letters or philosophy.

Within a very few years there has been some increase in the proportion of students in the faculties of the mathematical, physical, and natural sciences; but even this is attributed by the leading educational men of the country, not to a growing love of those studies for their educational value so much as to the fact that they are more and more coming to be regarded as prerequisite to the most successful practice of the industrial arts, to which the recent political changes have given a new impetus, and upon which the present times are making greater and more constant demands.

The term of study and the courses of instruction in the several faculties of the Italian universities have been given already in the chapters on professional schools, to which the reader is referred for particular information. The term of study requisite to examination for degrees being in no case less than four years and in the faculty of medicine six, the courses of study subdivided and very complete and the means of illustration ample, there appears to be nothing wanting but thorough

discipline and living zeal on the part of the management to insure a high degree of scholarship. But there lies the chief difficulty. The discipline is deplorably lax; the students doing much as they please, not unfrequently quitting one institution and seeking another, where the final examinations are believed to be easier; and, according to Signor Matteucci, sometimes leaving almost in a body, before the close of the term or year, as the notion takes them.

The degrees of doctor conferred in the various faculties are as follows:

In the faculty of jurisprudence, doctor of juridical science and doctor of politico-administrative science.

In the faculty of medicine and surgery, doctor of medicine and surgery.

In the faculty of the physical, mathematical, and natural sciences, doctor of pure mathematics, doctor of physico-mathematical science, doctor of physical chemistry, and doctor of natural history.

In the faculty of letters and philosophy, doctor of letters and doctor of philosophy.

In the faculty of theology, doctor of theology.

Where a condition of things exists like that hinted at above, it may be inferred that the degrees are not fenced in by the most rigid and thorough examinations possible; a presumption confirmed by the report already quoted, *(Sulle Condizione, etc.,)* in which the masterly author, ambitious for the advancement of every department of Italian education, laments the fact that there are nine or ten universities by which, during a long course of years, there was not one pupil rejected at the examinations for the degrees. But, as an offset to these, there are several in which the black balls appear to have been used with quite unsparing hand. For example, during the decade embraced between 1855 and 1865, Parma examined 737 candidates, approving 637, (with distinction, *con plauso*, 43,) and rejecting 57; Pisa examined 1,054 candidates, sending out 710 approved, (279 *con plauso*,) and rejecting 74; and Naples, still more careful of her honors, out of the whole number of 6,710 examined, approved 5,660, (370 *con plauso*,) and rejected 680.

But nothing is more manifest than that a thorough reorganization under the inspiration and resolute guidance of a wise and strong leader, backed by the power of the government, is a pre-requisite to the recovery and maintenance by Italy of the supremacy in university education once enjoyed by her, and for which, by reason of that eminent love of fine culture for many centuries characteristic of the Italian mind, she seems so well fitted. Happily for her future, and for the progress of true learning everywhere, the superior council of the kingdom has already taken the initiative in this important work, by forcibly presenting the importance of many reforms, most, if not all, of which are likely to be made at an early day.

BRITISH UNIVERSITIES.

Contemporaneous with those of France and Italy in their origin, the universities of England have undergone so few radical changes during the more than six hundred years of their history, that, except the universities of Sweden, they more nearly present the original type than any other institutions of this class in Europe. They do not still preserve the *national* feature by which all the universities of the twelfth and next subsequent centuries were characterized, but the college feature of which, as I have said before, there remain but two or three relics in Italy, is still prominent; indeed, it constitutes their chief peculiarity. On the other hand, they have shown less tenacity than the continental universities in the matter of preserving distinct and well-organized faculties, of which there can be said to be none now in the two ancient universities of Cambridge and Oxford.

These famous institutions, as remarked in the chapter on schools of letters, are in fact not universities at all in the sense of being a cluster of schools, literary, scientific, and professional, with the purpose of representing every department of human learning, but simply federations of numerous colleges—Oxford including 24, and Cambridge 17—all of the same type, and having for their chief, we may almost say their only object, the advanced general culture of those who attend them.

ORGANIZATION AND GOVERNMENT.

Each college is a separate corporation with its own governing body, consisting of a head elected for life, and variously known as president, rector, provost, master, principal, or dean, and of numerous fellows—graduates of the university elected to the enjoyment, during celibacy, of certain incomes accruing from numerous ancient foundations. Each college has also its own statutes, with the power subject thereto of making laws for itself. The teachers in the several colleges are known as tutors, and are generally chosen from among the fellows, as are likewise the administrators of college discipline, called deans or censors.

The relation of the colleges thus organized to each other and to the university proper is very analogous to that sustained by the several States of the American Union to each other, and to the federal or national government; for, although to a certain extent independent, each college is, nevertheless, bound by the general laws of the university and is represented in the federal government, which consists of two branches, the legislative and the executive.

The executive officers of the university are a chancellor, a high steward, a vice-chancellor, a commissary, a public orator, and various subordinate officers, such as moderators, scrutators, proctors, pro-proctors, an assessor, registrar, librarian, &c. The Oxford—and I believe also the Cambridge—chancellor is elected for life by the university convocation, and for some centuries has been some nobleman of distinction.

The vice-chancellor, who is the active head of the university, as also some of the other remaining executive officers, are nominated by the chancellor and confirmed by the convocation. The proctors are chosen from among the masters of arts out of the several colleges in turn, and are charged with the enforcement of the laws. The orator is appointed by the convocation to prepare the public letters, addresses, &c., for the university.

The legislative department of the university government is somewhat differently constituted in these two universities. At Cambridge it consists of the senate and the council of the senate; the senate being composed of two houses—the regents' house and the non-regents' house—and the council of the senate consisting of the chancellor, the vice-chancellor, four heads of colleges, four university professors, and eight other members of the senate. At Oxford there are three legislative bodies—the hebdomadal council, composed of the chancellor, vice-chancellor, six heads of colleges, six university professors, and six members of convocation; the house of congregation, consisting of all the leading officers of the university, heads of colleges, professors and assistants, public examiners, and finally all resident members; and, thirdly, the house of convocation, comprising the house of congregation with the addition of all masters of arts in their first year and persons who have been regents, but have retired from the university.

The hebdomadal council has the right to initiate new measures, but all statutes framed by it must have the approval of the other two bodies. The house of congregation enjoys the prerogative of granting all the degrees, graces, and dispensations; and the house of convocation is engaged only with the most important affairs.

The whole number of members inscribed on the books of each of these universities, as members of the various bodies, is some seven thousand or eight thousand.

The professors, numbering about thirty-five at Cambridge, and forty at Oxford, are among the ablest and most learned men of the kingdom, and the chairs they hold are regarded as places of high honor. But the college tutors, of whom there are some one hundred in the twenty-four colleges and halls of Oxford, and seventy-five in the seventeen colleges of Cambridge, are, as elsewhere remarked, young men of but little experience, and often of little development, who hold their places rather as a matter of convenience and present advantage than of choice, and who cannot be supposed, therefore, to do the best quality of work.

Since the days of Newton, Cambridge has been the most noted seat of the mathematical sciences in England, and very recently, both here and at Oxford, the natural sciences, history, jurisprudence, and political economy have been admitted to places of honor. Indeed, in a certain irregular, unsystematic way, more or less instruction is now given in branches of study belonging to the five faculties constituting a French or Italian university. But the professoriate has been of slow growth,

as of a graft upon an uncongenial stock, and thus far the result has been very inferior to what it might have been under a proper organization, or even without organization, had measures of some sort been adopted to secure the attendance of students upon the lectures given. But the task imposed by the college has been the regular work of the student, and the courses of lectures by the university professors are still regarded, and by the great body of students treated, as bringing with them extra labors, which may be accepted or neglected as it may suit their taste or convenience. The theory on which the educational system is based, therefore, is this, viz., that the true object of such institutions is formation rather than information of the mind, and that, in order to this, both the intellectual training and the moral control characterizing the collegiate system are essential. Learning and research are denied to be the legitimate end or even a leading object of university education, and the doctrine that it is safe to leave young men to form their own religious views is regarded as no less heretical and dangerous.

The drill of the grammar school, the regular inculcation of religious principles, as approved by the state church, and the final oath of allegiance thereto of all who aspire to the doctorate, or even the master's degree, are accordingly insisted upon with a positiveness and a vehemence that strongly savor of the old religious bigotry and intolerance of the Middle Ages. But, then, there is another view that may be taken of this particular phase of Cambridge and Oxford, and one that we are bound to take before we pass final judgment. They were originally nothing but aggregations of such colleges or grammar schools as they now are, and were intended by their founders to so remain. Not only so; they were also endowed in the interest of the church quite as really as in the interest of learning, and though at present strict denominational schools, they are no more sectarian than they were originally, and were always designed to remain by those who provided their material foundation and the means of their support through all the past centuries of their acknowledged great usefulness. They are not state institutions at all, although having some connection with the state through the appointment and partial support by it of some of their professors, and by the representation of them in Parliament by men of their appointment. And until they become such and are regulated by the state, nay, until the state itself shall cease to be sectarian, there seems to be no good ground for either complaint or surprise that they are managed in the interest of the Church of England. But it is surprising that even the church has not gained wisdom enough to see that the real interests of religion, and the profoundest, broadest, and highest culture of the best minds of the country must, of necessity, perfectly accord, and still more remarkable that the state has not yet been aroused to the fact and the cause of the present inferior rank of England in that highest department of intellectual activity—the philosophical—for which she has demonstrated so remarkable an aptitude by her splendid achievements in the preceding centuries.

As to the qualifications of applicants for admission to the universities, there are none; each college establishes them to suit itself; and there is, therefore, the greatest imaginable variety, from a high competitive standard, intended to exclude all but the most gifted and best qualified, even down to no examination at all; so that young men are not unfrequently admitted at the inferior colleges who are totally ignorant of the rudiments of a liberal education.

The fees to such as are not provided for from foundation funds for poor scholars are much higher than in France, and many times higher than in Italy. They are also marked by this peculiarity, that they vary considerably, according to the rank and condition of the applicant; the matriculation fees ranging between £1 5*s.* and £16, the *caution money* (advance payments) between £10 and £50, and the average unavoidable cost of maintenance being about £60 per annum.

The number of sessions or terms per annum at Cambridge is three; at Oxford, four; of examinations at Cambridge, one; at Oxford, two.

EXAMINATIONS FOR DEGREES.

Examinations for degrees are of two kinds—the easy, general examination for such unambitious slip-shod pupils as satisfy themselves with the ordinary or *pass* degree, and the high-pressure, competitive examination, at the conclusion of the *honor course*, for such as would contend for supremacy in the various "final schools" or departments of learning embraced in the curriculum of the university. The competitive examinations at Cambridge have no parallel in the extravagant length to which they are carried, especially in the school of mathematics, which, as already remarked, is the prominent school in this university. At Oxford, the school of *literæ humaniores*, or classical literature and philosophy, has a corresponding prominence; the schools of mathematics and physical science, of natural science, of medicine, and even of law and history—whose growth has been surprisingly rapid of late years—being entirely subordinate, notwithstanding the fact that with the exception of the last-named and that of natural science, they have long been "honor courses."

Competitive examinations, in themselves, are certainly excellent, and ought to be introduced as a test of qualifications for every important branch of service. But they are liable to prove injurious rather than beneficial if so managed—as is unquestionably the case of the English universities—as to stimulate the selfishness of pupils and encourage them to confine their studies to subjects that bear directly upon the attainment of honors, instead of prompting them to seek the broadest and deepest culture for its own sake.

The examinations are conducted by examiners appointed by the vice-chancellor and proctors, and receive moderate compensation for their services. Hence, too, there seems to be ground for criticism, if the charges made by leading friends of reorganization and the admission

of prominent defenders of the present system in the main may be taken as authority; for it is both claimed and admitted that under the present arrangement the office of examiner is often refused by those who are the most competent and falls into the hands of young men of inferior qualifications. This is especially the case at Oxford, where the examinations—being semi-annual—occupy much time, and where the compensation is, therefore, comparatively less. The competitive examinations are naturally the center around which all else revolves, and yet they are confessedly very imperfect.

The "pass" examinations are no less faulty in that the standard set up is shamefully low. On this point I prefer to quote the testimony of the dean of Christ Church, Oxford, who ought to be good authority, and whose language as recorded in the minutes of evidence taken before the select committee on Mr. Ewart's bill for university extension, (Parliamentary papers, July 31, 1867,) is as follows:

Question. "What is the state of the 'pass' examination at Oxford; does the 'pass' at Oxford require a competent knowledge of classics, mathematics, and physical science, or are any of those subjects omitted?"

Answer. "No; it requires a not very great acquaintance with classics, a very insufficient acquaintance with mathematics, and none with physical science."

Question. "In point of fact, it requires no acquaintance at all with mathematics, as a matter?"

Answer. "Nothing but an examination in the first two books of Euclid, and a certain quantity of arithmetic, I think."

The conditions of residence differ somewhat at Cambridge and Oxford, for while at the former institution students may live in lodgings of their own selection, though subject to the control of their particular college in all other matters, at the latter they are required, without exception, to live in the college or hall where admitted until at the end of three years, when they may select their lodgings outside, being afterward subject to even less restraint than at Cambridge.

The degrees conferred at the English universities are those of bachelor of arts, bachelor of divinity, bachelor of medicine, bachelor of music, bachelor of laws, master of arts, master of surgery, doctor of music, doctor of medicine, doctor of divinity, doctor of civil law, and doctor of laws.

The first, or bachelor's degree, is conferred at the end of a four years' course of study, three and a half of which must have been spent at the university; except in the case of "relations of royalty," members of the peerage, bishops, baronets, and knights, who, at Cambridge, are admitted to the examinations for degrees after seven terms, ($2\frac{1}{3}$ years,) and at Oxford after twelve terms ($2\frac{1}{2}$ years) of study. It is in the examinations for this first degree in the arts that lies the moving force of these two universities, for although the majority of students are satisfied with barely squeezing through and gaining a "pass" degree, there is always a

sufficient number out of the hundreds looking to graduation who are fired with ambition for the glittering *honors* held out to them to induce a most spirited competition.

At Oxford three successive examinations are necessary; the first occurring in the Lent term of the second year's residence, and including, as the more important subjects, one of the four Gospels, or the Acts of the Apostles, in the original Greek, Paley's Evidences, and one of the Greek and one of the Latin classics, the examinations being conducted by moderators and examiners appointed by the university senate. The final examinations are intended to be very thorough, and are really very much more so than in former times. They lead to the four classes of honors—honors in the arts generally, the examinations of candidates for which last twenty-two days; mathematical honors, the examination for which extends over eight days; classical honors, the examination for which lasts five days; and honors in the moral and natural sciences. At the conclusion of the examinations, a considerable number—thirty or more—of those who have most distinguished themselves are recommended by the examiners to the proctors for public approbation, and then divided into three classes, according to merit, to wit: *wranglers*, *senior optimes*, and *junior optimes*, the members of each class being named in alphabetical order, and the highest of all in rank being styled the *senior wrangler* for the year. The candidates then take the oath of allegiance, and swear to observe the statutes of the university, after which they are admitted to their degrees by the vice-chancellor, and subsequently to such rewards, in the way of "exhibitions," or stipends and scholarships—of which there are a large number—as they may be adjudged entitled to.

At Cambridge a similar, though more extreme, system of stimulation is in force. The number of examinations is the same, but those who have distinguished themselves are divided into four classes, under the four following divisions: *literæ humaniores*, *disciplinæ mathematicæ et physicæ*, *scientiæ naturales*, and *jurisprudentia et historia moderna*; and the members of each of these classes are also arranged in the order of merit, instead of alphabetically, as at Oxford.

The higher degrees above enumerated are conferred more as testimonials of general standing in the departments to which they belong, though the degrees of M. D. and D. C. L. are hedged in by examinations more or less thorough. At Cambridge—and the practice at Oxford is not materially different—the candidate for the degree of D. D. must be a B. D. of five years, or an M. A. of twelve years' standing; the candidate for the degree of D. C. L. must be either a B. C. L. of five, or an M. A. of seven years; and the candidate for the degree of M. D. must be an M. B. of five, or an M. A. of seven years' standing.

ENDOWMENT AND MAINTENANCE.

As aggregations of schools, Cambridge and Oxford are both wealthy institutions, enjoying annual incomes of over $2,000,000 each. But these

large amounts are really the total incomes of the various colleges, derived from ancient endowments and annual fees; whereas the universities, properly and legally so considered, enjoy but very small incomes, scarcely exceeding £6,000 to £8,000 per annum. And inasmuch as the college incomes are confined to the particular colleges for which the endowments were originally granted, and to the particular objects named in the grants, all deficiencies in the revenues of the universities themselves, necessary to the support of professors and to meet other general expenses, require to be, and are, made up by the state, though the amount of parliamentary appropriations for such purposes is never large.

The museums, observatories, botanical gardens, libraries, &c., some of which—particularly the great university libraries, which contain between 200,000 and 300,000 volumes each—are very extensive, are supported by funds derived from endowments specially granted by wealthy friends of education during the long centuries since the date of their origin.

The college foundations at Oxford are sufficient for the support of nearly six hundred fellows, and those of Cambridge are scarcely less productive, the average income of fellows being something over £230, while heads of houses receive £1,000 and over.

The number of students at Oxford is usually twelve hundred to fourteen hundred; at Cambridge, about fifteen hundred.

The other British universities are: London University, the University of Durham, Edinburgh University, St. Andrew's University, Aberdeen-Glasgow University, and Anderson University at Glasgow, and Queen's and St. Stephen's Universities, at Dublin.

UNIVERSITY OF LONDON.

The University of London, established at the instance of Lord Brougham and other liberal friends of reform in education, in the year 1836, has for its object the promotion of sound learning without regard to rank, sect, or party. It provides no instruction whatever, but, by authority of Parliament, sits in judgment upon the qualifications for honors of all who present themselves as candidates for either the literary or professional degrees. It is, in fact, a board of examiners of government appointment, and nothing else. The broad principle on which it rests was calculated to command the respect of the great English public, and its duties have been so ably and impartially performed that it has come to be an extra honor to have passed its ordeals; so that it is not uncommon now for graduates of Oxford and Cambridge to undergo its examinations also.

Durham University is of recent origin, (1833,) and has not attained to much importance. Instruction is pretty much confined to the liberal arts and theology.

UNIVERSITIES IN SCOTLAND.

Edinburgh, now nearly three hundred years old, has long been distinguished among the British universities. It includes the four faculties of arts, medicine, law, and theology, with power to confer the ordinary degrees. It possesses a valuable library of 100,000 volumes, and which is constantly increased in extent by means of an annual grant of £575 from the government, by the £1 fees paid for it by each matriculant, the £5 contribution made by every new professor, and a percentage on the graduation fees in the arts and in medicine. It has likewise an extensive museum, rich in objects illustrative of natural history.

Under an act of Parliament passed in 1858, a board of commissioners appointed by the Queen has had in progress a revision of the statutes regulating the matter of foundations, the election of university officers, and the courses of study; and the result has been an infusion of new life into what had become a rather dull and lax institution, doing even less than the English universities to advance the cause of thorough and profound culture. Touching this subject, Professor Blakie, of Edinburgh, is quoted by Dr. Döllinger, of Munich, as saying: "Scotland, at the present moment, is in no sense of the word a learned country; especially at our universities learning is at the lowest possible ebb."

A large proportion of the professors (thirty-two in number) are appointed by the corporation of the city, and others are appointed by the Crown.

The term of study requisite to admission to the examinations for degrees is four years; the number of terms per annum two, the first commencing November 1 and ending April 30, and the summer session commencing the first Monday in May and ending with June.

The students visit the university simply for the purpose of instruction, and board wherever they like. The number in attendance is usually about fifteen hundred. The foundations for the support of students are of trifling importance, the total annual income therefrom amounting to but little more than £1,000; which amount is shared by some eighty students.

Examinations for the degree in arts are chiefly occupied with Latin and Greek, mathematics, rhetoric, natural and moral philosophy. The regulations governing the granting of degrees in the professional departments have been already considered under appropriate heads.

St. Andrew's University at St. Andrew's, though the oldest university of Scotland, has never attained to great importance. It consists, in fact, of two or three literary colleges and a divinity college, and may be ranked in the same category with Durham.

Aberdeen University is, likewise, simply an institution of this same general character, minus the college of divinity.

The University of Glasgow, founded 1451 under a bull of Pope Nicholas V, is a flourishing institution and possesses some peculiarities worthy of special mention. The academic course extends over four

years, but there is only one session annually, which commences on the last Wednesday of October and closes May 1. Students applying for admission are expected to have mastered the Latin beforehand, and are required after entering, whatever else they do, to give particular attention to Greek during the first year, to logic the second, to moral philosophy the third, and to natural philosophy the fourth year.

The number of students in annual attendance is about one thousand, all of whom are day pupils, boarding where they choose. The only aid granted to pupils consists of sixty bursaries, varying in amount from £5 to £50 per annum, and tenable for four to six years according to circumstances.

The academic body consists of the lord chancellor, the lord rector, the vice-chancellor, the dean of faculty, and some twenty-five professors.

The library contains over sixty thousand volumes, and the anatomical collection, bequeathed by the distinguished Dr. William Hunter, is one of the finest in Europe, being valued at nearly three-quarters of a million of dollars.

The Anderson University, so called in honor of its founder, Dr. Anderson, professor of natural philosophy in the University of Glasgow, originated in a desire to make provision for the instruction of the working classes of the city in the mathematical, physical, and natural sciences, as well as in literature and the arts, and even in medicine. It enlisted the sympathies of many of the ablest professors, lecturers, and teachers of Glasgow, and early met with extraordinary success; the number of pupils in attendance having, in some years, equaled seventeen hundred.

QUEEN'S UNIVERSITY, DUBLIN.

Queen's University, the chief university of Ireland, is an anomalous institution, embracing the colleges of Cork, Galway, and Belfast, and holding its senate in Dublin Castle. It is a sort of University of London, therefore, but restricted in its jurisdiction to the colleges named, instead of opening its examinations to, and conferring its honors upon, the pupils of fifty or more colleges, as does the London University board. Its three branches report an aggregate of nearly one thousand students. The annual grants to the colleges themselves amount to about £26,000; to the central, or university organization, some £3,000.

SPANISH AND PORTUGUESE UNIVERSITIES.

The present universities of Spain require but little attention, as, in common with every other department of education, and with the industrial, civil, and political institutions of the country, they have long been in a half-decaying and almost dormant condition. Theoretically, there are ten of them; but in reality there are but six that seem entitled to the name, to wit, those of Madrid, Salamanca, Seville, Saragossa, Valencia, and Valladolid; and even these are less than universities in the

strict sense, or even as compared with the best French or Italian examples. They are formed much after the Italian model, but, almost without exception, are incomplete in the number and constitution of their faculties, and are deemed by progressive statesmen and scholars the chief bulwark of effete political institutions. Their funds have been squandered by civil war, and many of their buildings are in ruins.

The one at Salamanca, as already mentioned in Chapter I, was established in the thirteenth century, and from about the middle of the fourteenth was long a rival of those at Paris and Bologna, having no less than twelve thousand students; but at present its condition is less prosperous than that of any of the other six above named, the faculties being badly organized and the number of students scarcely more than three hundred.

The universities of Seville, Saragossa, and Valladolid, also ancient, are in a much better condition and are better attended; the first claiming one thousand students and being provided with very valuable museums of geology and mineralogy, chemical and physical laboratories, a library of some sixty thousand volumes, and with rich collections of sculptures and pictures. Unlike the University of Salamanca, where they are largely subordinate to the humanities, the University of Seville shows a sort of French partiality for the mathematical, physical, and natural sciences. This same is also true, to a great extent, of those of Saragossa, the number of whose pupils is over one thousand, of Valladolid, which numbers over thirteen hundred, and of Valencia, which claims fifteen hundred.

The University of Madrid was formerly located at Alcala, from which place it was removed as late as 1836. Its curriculum of study up to that date had been so narrowly limited to the *literæ humaniores* that the creation of chairs of natural history, astronomy, and medicine, at the date of re-establishment, was a very important event in its history.

In Spain, as in Italy and France, theology is so widely and preferably taught in the theological seminaries that it receives but little attention, in the way of systematic teaching, in the universities.

Engineering, navigation, commerce, architecture, and art, so far as they are taught at all—and some of them are quite thoroughly taught—are provided for in special schools and have no place in the universities, which are, therefore, pretty much confined to the humanities and to law and medicine, although such of them as claim to be full universities embrace the five faculties found in those of Italy and France.

The total number of students in annual attendance is not far from eight thousand, or one to every two thousand inhabitants.

Portugal has had but one university from the beginning, the Royal University at Coimbra. This institution was founded in 1290 at Lisbon, but removed eighteen years afterward to its present seat, where it has continued to flourish without interruption ever since. It embraces eighteen colleges like those of Cambridge and Oxford, but likewise

includes quite complete university courses arranged in six faculties, equivalent to faculties of letters and philosophy, of mathematical and physical science, of natural science, and of law, medicine, and theology.

The courses of study extend through periods of four to six years, and the examinations are said to be unusually thorough. The number of professors is forty-eight; of teachers of lower rank, forty; of pupils, one to two thousand.

GERMAN UNIVERSITIES.

Under this head I shall include the universities of all those countries in which the German mind is the controlling power, and in which the institutions are, therefore, mainly of the German type, viz: those of Austria, first in chronological order; Prussia, with its several provinces; the recently acquired duchies of Hesse-Cassel and Schleswig-Holstein, and the kingdom of Hanover, Saxony, Bavaria, Wurtemberg, Baden, Hesse-Darmstadt, Saxe-Weimar, and Mecklenburg-Schwerin.

The total number of universities embraced is 27; of which 8 belong to Austria, 9 to Prussia, 1 to Saxony, 3 to Bavaria, 1 to Wurtemberg, 2 to Baden, 1 to Hesse-Darmstadt, 1 to Saxe-Weimar, and 1 to Mecklenburg-Schwerin. They all agree in certain general characteristics, among which are predominant, motive, mode of maintenance, official organization, administrative regulations, number and constitution of faculties, general terms of admission, term of study, and character of degrees conferred.

It is in the German university, as nowhere else, that the leading object is science—not science in the popular but in the highest and most comprehensive sense, as standing for the profoundest and most exhaustive knowledge of every branch of human learning. Science is primary; profession is secondary. This is the rule, and if any of the universities fail to be governed by it they fail in just so far from reaching the ideal standard. For the realization of this ideal the state and the learned class co-operate with harmony and singleness of purpose, while the great middle class of the people, proud of the noble institutions thus sustained and directed, second that purpose, and give to the universities all needed practical support. And, accordingly, more than any others of Europe, they present that rare compromise between the largest liberty and the most complete state control, which, when properly adjusted and harmonized, are so well calculated to yield the most satisfactory results.

The institutions were originally founded by the government, and the statutes, organization, and instructional force are of its creation. Moreover, the state makes provision from its own treasury for all deficiencies in their incomes from property and fees, which, in most cases, are small in amount, and constitute but a small part of the total cost of maintenance. And yet, within liberal constitutional limitations, the university authorities are practically the managers of all their internal affairs, with but little or no interference from the state, whose object is simply to make sure that the great purposes for which the institutions were established are faithfully carried out.

The minister of public instruction, or some other delegated agent of the sovereign, where such ministry does not exist, is the immediate source of all authority; the legislative department and the sovereign are the ultimate source. Subordinate to, and appointed by, the minister are the curator, whose duty it is to represent the government by the enforcement of the laws and regulations which govern the universities; the professors; and the quæstor, an officer of inferior rank, charged with the duty of collecting all fees due from students to the professors, and of paying over the same, retaining a small percentage for his salary and for the treasury of the university.

The other officers are a rector, (usually styled *rector magnificus*,) a pro-rector, a judge, (*Universitäts-Richter*,) in some cases a chancellor, (*Kanzler*,) and deans of faculty, all of whom are chosen by the full professors for the term of one year only, though the same person is eligible to a re-election.

The rector, as in France, Italy, and many other countries, is the visible head of the university, his office corresponding in powers and duties to those of vice-chancellor in England, and of president in the United States. Whenever it becomes necessary for him to act in a judicial capacity upon questions involving an infraction of rules, or when other persons than members of the university are called before him, he has the *Universitäts-Richter* to act with him in deciding the case.

The pro-rector, except in Austria, where he is a sort of lieutenant to the rector, is found in the German universities only in cases where, as at Halle and Jena, the sovereign is the nominal rector, in which event the pro-rector is *de facto* rector.

The dean (*Dekan*) is chosen annually by the professors of the faculty to which he belongs, and of which he acts as presiding officer at all meetings and in the decision of all questions belonging to faculty jurisdiction. In some institutions there are also *Pro-Dekane*, or vice-deans, and, besides these, directors, in more immediate charge of the practical affairs of the several faculties.

The legislative body and, at the same time, executive council of the German university is the senate, (*senatus academicus*,) composed of the rector, (or pro-rector, or both, where both exist,) the out-going rector, the *Universitäts Richter*, the deans of the four faculties, and four or five from the number of ordinary professors, chosen by their fellows. In some cases, as at Leipsic, four or five professors, in addition to those above referred to, are made a part of the senate by appointment of the minister; and in still other instances the secretary, the *Kanzler*, and other officers are likewise members *ex officiis*. In many universities this is the only deliberative body, but in others, as in that of Leipsic, there are, besides this, a larger senate, including, besides the general officers, the whole body of ordinary or full professors, (known at Leipsic as *das Plenum der ordentlichen Professoren oder der weitere akademische Senat*, and at Halle

as *das Generalconcil*,) and a university assembly, (*Universitäts Versammlung*,) which also includes honorary and extraordinary professors.

The university court is an institution peculiar to the universities of Germany and two or three other countries, to which they have served as models, and constitutes very interesting evidence of the high esteem in which they have always been held by the state, and of the large amount of liberty they enjoy.

For ordinary cases the court consists of the rector and university judge, but for the trial of grave offenses a number of professors are added. The constitution and jurisdiction of the court differ somewhat for the various universities, but in the main the resemblance is so close that a single example will serve as an illustration of all.

At Göttingen, for instance, the jurisdiction of the university includes:

1. The officers and professors, assistant professors and private lecturers, connected with the university.

2. The students of Göttingen University.

3. The governors or private tutors of the university students.

4. All students of other universities so long as they reside at Göttingen.

5. The wives of all the above persons, and their children during the life of the father.

6. Even after the death of the father the widows and children of the following:

Of ordinary and extraordinary professors.

Of the officers of the court of the university, including the clerk.

Of the officers of the library, including the secretaries.

The cases embraced within the jurisdiction of the university court belong to the following classes: 1. Discipline. 2. Offenses ordinarily belonging to the jurisdiction of the police. 3. Common civil process and collections as defined by law. 4. Voluntary judicial proceedings.

Acts of students against police regulations are to be treated as acts against discipline only.

To give efficiency and practical value to these prerogatives of the court, the university charter provides that the administration of the police in the city of Göttingen shall be divided between the magistrate of the city and the officers of the university. The university has its own police officers, therefore, who are strictly under the direction of the academical authorities. Students committing any offense may be arrested, in very urgent cases, by the city police; but they must be forthwith delivered over to the academical officers. And so, on the other hand, citizens of Göttingen may be arrested by the university police, but they must be immediately surrendered to the proper city authorities.

In case of riots or other serious disturbances of the peace, both classes of police act in concert for their suppression and the arrest of the offending parties.

All more important offenses, such as would be punished by more than three day's imprisonment, are tried by a court tribunal, consisting of

five regular or full professors, including at least three jurists, all of whom are chosen by the whole body of ordinary professors at a meeting held for that purpose.

Thus the German university is a sort of little republic, with its legislative, executive, and judicial departments, and maintaining under its constitution a quite independent existence. Not only so, like the universities of Oxford and Cambridge, it has, in some cases, the constitutional right—a right long enjoyed by Göttingen—to a representative in the national legislature, its representative being chosen by the ordinary professors. The franking privilege, within very generous limitations, is still another immunity very commonly enjoyed, and one which contributes very greatly to an interchange of valuable correspondence and exchange of printed matter between all the universities of the German States.

FACULTIES AND INSTRUCTORS.

The standard number of faculties embraced in the German university is four; the Royal Bavarian University at Munich, which adds a faculty of political economy, (*staatswirthschaftliche Facultät,*) and the Royal Wurtemberg University at Tübingen, which possesses both a Catholic and an Evangelical faculty of theology, and to its philosophical faculty adds a faculty of political economy, and another of natural science, (*naturwissenschaftliche Facultät,*) constituting the only important exceptions.

The regular faculties are those of theology, (Protestant or Catholic, according as the one or the other is the dominant religion of the country,) of law, of medicine, and of philosophy; the last-named comprising not only philosophy distinctively considered, but likewise language and literature, together with the mathematical, physical, and natural sciences; in short, the whole range of knowledge as considered independent of the professions. Each faculty, through its ordinary professors, headed by a dean, regulates its own internal affairs, subject to the statutes of the university, the senate, and the administrative head, looking to the enforcement of all regulations among its own members, straightening up all delinquencies, and, if necessary, handing over offenders to the superior authorities for punishment.

As an instructional force, the faculty consists of all persons who have authority to teach in the department of learning in whose interest it was organized, to wit: ordinary or full professors, (*professores ordinarii* or *ordentliche Professoren ;*) extraordinary professors, (*ausserordentliche Professoren,*) sometimes also known as *Adjuncten ;* private lecturers, (*Privatdocenten ;*) instructors, (*Lehrer;*) and assistants, (*Assistenten.*) In most institutions the first three classes constitute the entire body of instructors; the fourth and fifth classes being peculiar to Austria.

The ordinary professors of Germany correspond to the *professeurs titulaires* of France. They are named by the minister, or by the sovereign,

and are partly, in some institutions wholly, appointed by the state. Each one is assigned to a special branch of study belonging to his faculty, upon which he is bound to give at least two public lectures weekly, free of charge, to students. Lectures not thus free are termed private, and the professor may give as many of them as circumstances will permit. The average number, however, is between four and five a week; the ordinary duration of each lecture, except in the case of chemical or other demonstrative lectures, being one hour. The number of ordinary professors in each university and faculty is usually limited, yet the state may, if it chooses, name a distinguished man as professor in any faculty though it be full, paying him the regular professor's salary, a thing which has several times been done as a special reward for high merit. The salary received by the ordinary professor being derived partly from the state and partly from examination and tuition fees, is not an unvarying amount, though it sometimes rises to a very handsome figure. The amount derived from the state is alone fixed. This, however, varies materially for different institutions, according to their resources and to the wealth of the state. In some instances it is as high as $2,000 per annum. The portion derived from examination fees depends, of course, largely upon the popularity of the faculty as a whole, and at such numerously attended universities as those of Berlin, Vienna, Bonn, Munich, Heidelberg, Göttingen, and some others, amounts to a considerable sum, while in others it is very small. But the fees derived from pay lectures are determined in amount by the popularity of the professor himself. And here is one secret of the great activity shown by nearly all, and the remarkable genius and power developed by many. So far as money can be made an incentive to action, they have the benefit of that incentive. Under this threefold arrangement I have not been surprised to find the incomes of many German professors amounting to from $5,000 to $8,000 per annum, the equivalent of at least $10,000 in this country.

The limit to the number of ordinary professors, the high qualifications of which the possession of the office is a sure guarantee, (since no one can receive the appointment of full professor unless possessed of the doctorate in the faculty to which appointed, nor then unless known to have marked ability in his department,) and the fact that to the man of genius and ambition the professorship is a very sure door to both fortune and fame, all these circumstances, with many others, cause the professor's chair to be very eagerly sought. It is, in fact, the high prize offered by the career of public instruction.

The extraordinary professor of the German university is the *professeur suppléant* of the French faculty. His real position is that of an assistant to the corps of regular professors. He does not in all cases, as they do, receive a fixed salary from the state, but is obliged to look to such fees as he can command by his ability as a lecturer. If essentially wanting, the students will very soon find it out and bestow their time and fees

upon some abler and more zealous professor. The extraordinary professors also have their appointment from the state, and are first in the line of promotion. They are taken from among the most distinguished of the next lower class, and not unfrequently, in ability and popularity, surpass their superiors in rank.

The *Privat-docenten*, though likewise found in Italy, and in the Scandinavian States, in just the character and importance of the office they fulfill, are peculiar to the German university. As their title indicates, they are private teachers, but in a very different sense from that in which the term private teacher is understood in this country. Nor does the title in any proper sense correspond to the English idea of tutor, which is that of a young man of moderate abilities and often more moderate attainments, pursuing the deadening, hum-drum routine of instruction in the college. They do in some cases perform the office of private tutor, giving lessons to individual students, which lessons then have the title of *privatissima*, but these are incidental and exceptional labors. Their chief work consists in giving lectures upon such branches of knowledge, embraced within the range of the faculty to which they belong, as they prefer to investigate and discuss. Practically, they differ in rank and privileges from the extraordinary professors in no respect, except that they are one step lower in the way of promotion, and are entirely dependent upon fees for their compensation. The lecture-rooms of the university are freely open to them when not occupied by the professors, and their lectures count just the same for those students who attend them. The regulation of the fees charged for lectures by the *Privat-docenten* is entirely with themselves, except that no one is permitted to charge a less fee for a given course of lectures than is the standard fee of the full professor for a like course.

The source of the authority of the *Privat-docenten* is also the minister, but the faculty must first approve of his occupying the place to which he aspires, and he must undergo an examination (entitled *Habilitation*) conducted by two professors therein, formally delegated by the whole faculty for the performance of that duty. None but a student or scholar of acknowledged ability and distinction, as a rule, will venture to offer himself as a candidate. Having done so, produced the requisite certificates of study, &c., and creditably passed through his *Habilitation*, he is nominated to the minister, upon whose confirmation—a matter of course in nearly all cases—the candidate is named a *Privat-docent*, and declared to be entitled to all the privileges of that office.

With such freedom as to the subject of lectures—a freedom so entire that the *Docent* is not unfrequently found, upon the same day and in the same lecture-room, delivering a lecture upon precisely the same subject as that discussed at another hour by a full professor—it will readily appear how great must be the activity of life and labor among the teachers at the German universities. Indeed, without a personal acquaintance with those institutions, and a just appreciation of how

remarkably personal ambition is subordinated to a pure and noble love of science, one finds difficulty in crediting their almost entire freedom from those jealousies and ungenerous rivalries which otherwise might be expected to have place in the midst of so much active competition. Here, also, and in the freedom of opinion enjoyed by all, one finds the secret of that extensive and profound scholarship by which German university professors are characterized, and of that scientific and progressive spirit which has given to the educational institutions of Germany a position in advance of those of all the other nations of the world. The governments of Germany are reckoned among the despotisms; yet there is no country on the globe in which intellectual liberty is so highly valued or so fully guaranteed by the sentiment and will of the great body of the people. The universities are the stronghold of this liberty. The professors, as before remarked, are of royal appointment, but removals for opinion's sake are nevertheless rarer there than even in America. At the great University of Berlin, under the very shadow of the royal palace, it is not at all uncommon to hear republicanism sanctioned and even eulogized at the expense of monarchism, and the bold professor is rarely interfered with, even to the extent of a gentle remonstrance from the sovereign or his minister. Genius, though by no means rarer, is more precious in Germany than in most other countries; and there is scarcely anything that a German sovereign will not submit to rather than the extinguishment of one of its intellectual stars from the university constellation.

The number of professors, actual and relative, of the two classes and of *Privatdocenten*, is as various as the number of institutions and faculties. In the countries heretofore considered, there has been found a great predominance in most cases of ordinary or regular professors; but in the German States we find the exact reverse of this, the number of extraordinary professors and of *Privat-docenten* largely preponderating in nearly every case, and in many more than doubling that of the ordinary professors. And it is worthy of remark that this very disproportion exists to a greater or less degree according as the university is more or less alive and prosperous. The same remark also applies equally to the faculties individually considered. The proportion of extraordinary professors and of *Docenten* is invariably greater in that faculty of a university whose prominence is greatest. Thus the relative number of these extra teachers is greatest at the universities of Berlin, Vienna, Leipsic, Munich, Göttingen, and Heidelberg, which are among the most prosperous and numerously attended of the German universities. Again, at Berlin the philosophical faculty is the great faculty, while at Vienna medicine is dominant; and it is in these particular faculties that we find much the larger proportion of extra teachers. And the same is true of many other institutions that I will not stop to name, all of which afford examples of "a rule that works both ways." The prominence given at any university to a given faculty constitutes it a

magnet, with attractive power for such as are partial to the department of learning by it represented; and the gathering of these about it as a center, in turn, tends still further to increase the prominence and popularity of such faculty.

The total number of professors and teachers in the German universities at the present time is over 2,200. A recent French reporter, (M. Minssen, sent out by Minister Duruy in 1866,) who, however, gives the whole number of complete universities as 23, whereas it is really 27, makes the number 2,031; of which total, the number assigned to faculties of theology is 238, to faculties of law 275, to faculties of medicine 520, to the philosophical faculties 786, and to the faculties of political economy 20. The lowest number belonging to a single university is 35; the highest, (at the University of Berlin,) 190.

The university year in Germany is divided into two semesters, known as the winter-semester and the summer-semester. The winter-semester generally begins about the first or middle of October, and closes about the first or middle of March; the summer-semester begins about the 1st of May, and ends about the 1st or 15th of August; so that the number of lectures or lessons by each professor doing full work averages nearly or quite one hundred.

There are no fixed courses of instruction in the German faculties, such as we have in the collegiate institutions of this country, and as are common in the faculties of Italy and some other countries; and yet the studies are not without some systematic arrangement; for, although so many of the lecturers give courses on such subjects as suit themselves, their lectures are so co-ordered and timed by the dean, to whom each one reports the subject of the course he proposes to give, that the student aiming at a degree is enabled to pursue his studies in logical order.

Of the kind and quality of the instruction I deem it necessary to say but little. No class of teachers have so high a reputation for thorough and exhaustive teaching as the German; and after recent comparisons of German university professors with those of nearly all other countries, I am able to confirm this estimate. The enviable position held by them is referable to several causes, prominent among which are, the philosophical, patient, and laborious character of the German mind; that long-cultivated and now natural love of research and profound learning, by reason of which there is among them a universal contempt for, and intolerance of, every species of superficialness and pretense; the consequent high estimate put upon learning by both people and government; and, as further consequences, that liberal endowment and support of the universities which allows of the necessary division of labor, with suitable rewards for service, and that fine *esprit de corps* which, as in no other country, here characterizes the teacher's profession.

It may still be considered an open question whether the universities of Germany do well to confine their instruction so exclusively to *lectures;*

but considering, as of course they do, that question settled in the affirmative, it is difficult to point out particulars in which the character of their work could be very materially improved. If, like our own and the British so-called universities, they were designed for elementary instruction, then it would seem that in some instances their courses of instruction were almost too exhaustive for the limited period of study adopted, which—except in the medical faculties of Austria where the term is one year longer—do not exceed four years; for in such event it is evident that the mind of the student would be too much burdened with details. But it must not be forgotten that such is not the design of the universities of Germany. Elementary instruction belongs to the gymnasia, which perform their office so thoroughly and well, as I have endeavored to show in Chapter IV, that the universities are enabled to confine their labors pretty much to the higher office of inducting their pupils, already very well disciplined and generally informed, into the matter and methods of philosophy and original investigation. And, accordingly, if at Berlin one, two, or even three theological professors and *Privat-docenten* choose to devote five lectures each per week for a full half-year to symbolical theology, or the book of Isaiah; or if in the philosophical faculty an equal number of learned professors should devote an equal time to the *Nibelungen*, to the *Sacoutala* of Calidâsa, to the limits between poetry and philosophy, or to the *Bhagvatgita;* or if a Viennese medical professor or *Docent* should take it into his head to give one hundred lectures on eye-glasses, they will none of them find difficulty in securing an appreciative auditory. The eager, philosophic mind of Germany demands exhaustive discussions of every sort of subject worthy of investigation, and it is one important object, if not the leading object, of the universities to furnish them.

ADMISSION TO GERMAN UNIVERSITIES.

The regulations which govern the admission to and connection with the German university are also matters of special interest. Up to 1788 nothing more was required for admission than a letter of recommendation from the school of the applicant's former attendance and the approval of the dean of faculty after a superficial examination to test his knowledge of Latin. But this laxity led to very bad results in the way of filling the universities with ignorant and worthless students; and, accordingly, in that year an edict was promulgated requiring that the public schools should examine their pupils before allowing them to proceed to the university, and that the university authorities should themselves examine all pupils coming from private schools. But in those days the universities were so much more strongly influenced by a desire for numbers than for high scholarship that the examinations instituted by them were often so far inferior to those held by the public schools that it became a not uncommon thing for boys to leave the public schools before the date of examination and enter private schools, in order that

their examination might be by the university authorities. Accordingly, in 1794 the *allgemeine Landrecht* provided that the admission examination held at the universities of Prussia should be by a *commission*. Still as there was no prescription of just what the examination should be, there was no uniformity, and other modifications of the plan became necessary. The first amendment, carried through the influence of that noble and intelligent friend of a higher university education, William von Humboldt, was a uniform examination obligatory upon all candidates, without regard to the place or circumstances of their preparatory training. But the details of this modified plan were still faulty, in that they provided for three grades of certificates to be issued to those who were to be examined; certificate No. 1 declaring the holder to be thoroughly qualified for the university, No. 2 that the possessor was partially qualified, and No. 3 that the candidate was found to be unfit for admission. This did not remedy the difficulty, for with the growing desire for students that followed upon the restoration of peace, in 1815, the universities lowered the standard of qualifications so as to receive the holders of second-grade, and finally of even third-grade, certificates. And so at last the government of Prussia adopted the method early suggested and urged by Schleiermacher, when a member of the council of education—that of confining the examination to the gymnasia, whose interest was not to crowd ill-prepared boys into the universities, but to send them only such pupils as would do honor to the school where prepared for the higher courses of study.

This examination is now known throughout the Germanic States as the *Abiturienten-Examen*, (the leaving-off examination,) and the certificate as the *Maturitätszeugniss*, (certificate of ripeness.) The examining board comprises the director of the gymnasium and the professors who teach in the highest class, (*prima*,) a representative of the *Schul-Curatoriums*, or board of curators, where the gymnasium has such a board of supervision, the joint-patronage commissary of the Crown, and a member or delegate of the *Provincial Schul-Collegiums*, or school board of the province; the last-named being always president of the commission. The examination is a very thorough one, and there is now no other door of admission to any of the faculties in any university. To guard against *cramming*, it is required that the candidate shall have spent his two full years in class *prima*, thus making sure that he has had fair opportunity for that thorough discipline and those solid attainments for which the German gymnasia are so justly noted; and the examination being, in the first place, upon such subjects as constitute the regular staple of class labor, is made to consist largely of paper work, (essays, &c.,) upon themes chiefly selected by the president of the examining commission. The general subjects embraced are German language, Latin, Greek, French, mathematics, physics, geography, history, and religion; and if the candidate proposes to enter any of the faculties of theology he is also examined in Hebrew. The examination papers are prepared by the director and pro-

fessors of the gymnasium, several sets being made ready, and the president of the board choosing from them. The paper work usually occupies a full week, and the *viva voce* examinations are participated in by all the members of the commission. The terms used, and the only ones, to designate the character of each performance are "excellent," "good," "sufficient," "insufficient." A mastery of the mother tongue, thoroughness in Latin, and extra-good standing, either in classics or mathematics, even though in the other branches he should be a little deficient, will secure him the approval of the board and the designation of *reif*, (ripe;) but upon the branches named there is no such thing as compromise.

Each member of the board of examination signs the certificate, which relates to conduct as well as attainments, and the delivery takes place at the end of the semester, an occasion of great public solemnity—on commencement day.

Should a candidate fail to pass, and so receive the designation in the report of the commission of *unreif*, (unripe,) he is recommended either to remain another half-year at the gymnasium and then submit to a second examination or to abandon at once all idea of entering the university. Should he refuse the advice of the board and apply at the university for admission it will avail but little; for without one certificate or the other he cannot be received at all, and with the certificate of *unreif* only in the faculty of philosophy; nor even there as a university matriculant, but simply as an auditor, entered in a special register, and getting no credit for time thus spent, should he conclude to retrace his steps to the gymnasium, and, through a second and last examination, finally gain the certificate of maturity.

Persons not members of any public school may make their way into the university, but they can only do so through the door of the gymnasium. The steps to be taken are these: The candidate first makes application to the *Provincial Schul-Collegium* for leave to attend the certificate examination of some gymnasium; presenting to the board, with his application, satisfactory testimonials as to study, moral character, &c., and a statement, in good German, written by himself, of his previous course in life. If approved by the board they send him to some convenient gymnasium for examination. In the event of failure to pass, the board of examiners are at liberty to name a time after which he may try again and for the last time. At such examinations some allowance is made for the circumstance of his being examined by a board of entire strangers; but to prevent advantage being taken of this, as well as to prevent a desertion of public-school pupils in class *prima* for private schools, so as to come in for examination short of the expiration of the full period of study, the law carefully provides that no one thus conducting himself can apply for the requisite examination within the two years of *prima* without special permission from the minister of public instruction.

Such are the regulations which in Prussia guard the door of entrance to the university; and, with but slight modifications, these are the regulations throughout Germany; and when it is remembered that the total of qualifications for the *Abiturienten-Examen* at the close of the gymnasial course is quite up to those demanded at our best collegiate institutions in America, and very much higher than those demanded by many of our so-called universities for the degree of bachelor of arts, we shall then be able to comprehend the difference between the highest German institutions and our own, and to get some idea of how intelligently the governments and people of these states unite their best efforts to advance the national culture and to save the learned professions and the civil service from candidates unworthy of the grave responsibilities involved.

Thus prepared with the evidence of his fitness to begin the study of science, letters, and philosophy, the ambitious student presents himself at the university of his choice, pays the matriculation fee of $4 to $5, signs an agreement to observe all the statutes and rules, and is enrolled on the general register as a member of the university, after which he may register in the faculty of his choice.

The lecture fees vary a little in amount in the different faculties; the highest being, as a rule, in the medical department, and the range being between $2 and $5 per semester. In some universities, as at Leipsic, for example, all public lectures are free, and in all there are either subsidies derived from endowment funds for the support of poor students, or provision by statute that such students as are unable to pay the very small fees demanded shall, nevertheless, be permitted to attend the lectures, afterward paying the total of fees out of their incomes when established in their profession. In Prussia, each university has a considerable number of subsidies, bursaries, or exhibitions, as they are variously called in different countries, for the benefit of poor students, amounting to sums varying from $60 to $300 per annum.

I have said that the term of study in the universities is commonly four years, that in the medical faculty of some being five years; but I have not yet stated what constitutes an important peculiarity of these institutions, viz: that no student is permitted to take a purely and exclusively *professional* course. He must give some time to the philosophical studies necessary to a broader and deeper culture. This rule, though in letter somewhat different in the different universities, is substantially the same in all. Thus at Munich, and in all the Bavarian universities, it is required by statute that each student shall devote at least one year to the studies embraced in the philosophical faculty; it being optional with him whether he will make the first year entirely philosophical, or carry his philosophical studies through the first two years, distributing his labors in that general field equally over that entire period, and pursuing them simultaneously with his professional course. In any event, it is obligatory upon every student preparing for a profes-

sional career that he shall attend at least eight regular courses (a regular course is one that occupies from four to six hours per week throughout the entire half-year) of lectures during the first two years of university attendance; it being strongly recommended that said eight courses shall include especially philosophy, philology, history, mathematics, physics, and natural history, and that carful attention be given, at the same time, to the historical development of these several departments of learning. To insure obedience to this regulation, the several faculties are forbidden to admit to examination for the degree any native student unless he can prove that he has fully complied with it.

It is also a peculiarity of the German universities that students are permitted to visit other universities during their four years' course, without loss of time in the final count. With the permission of the government they may also have the time counted that is spent in approved foreign universities.

Thus far I have spoken only of the regular courses. Concerning the extra courses—those given by extraordinary professors and *Privat-docenten*—it is sufficient, in this connection, to say that the fees demanded for them range between $3 and $14, according to the nature of the subject and ability of the lecturer; that in the final reckoning these lectures count the same as those termed regular; and that the delivery of a proposed course is compulsory upon the lecturer when a given number (usually ten or twelve) of students have subscribed; provided the subscribers demand it. All fees, whether for regular or extra lectures, are payable, in advance, to the quæstor.

Examinations, as a test of progress and proficiency, during the period of attendance are less frequent, except in those of Austria, than in the universities of almost any other country; the assumption being that young men, who have ripened for the university under the thorough discipline of the gymnasium, passed the trying ordeal of the *Abiturienten-Examen*, gaining with so much hard labor the *Maturitätszeugniss* requisite to entrance upon the higher course of the university, and for whom, under the regulations governing the degree-examination, there can be no honorable exit without a mastery of the prescribed courses of study, should be superior to the restraints, petty stimulations, and compulsions commonly employed in the public schools.

In fine, so far as students are concerned, the distinguishing feature of the German universities is the large amount of liberty they enjoy in harmony with the demand for large results. They lodge and board where they like, attend lectures when and where they prefer to—even though it should be at a neighboring university, more prominent and popular in a particular department than their own—and socially enjoy nearly as much liberty as the ordinary citizen; being only amenable to laws the enforcement of which is exclusively with the rector of the university and the university court, and the penalties for the violation of which are reprimands, fines, imprisonment in the university *Carcer* for

a period not exceeding one month, dismissal from the particular university attended, but with liberty to enter another, and absolute expulsion, (*Relegation*,)notice of which to the other universities is a positive bar to admission to any one of them.

Whether the liberty thus accorded to German students is better, all in all, than the system of restraints and artificial stimulants carried to such absurd extremes in some other countries, can hardly be a question with any unprejudiced observer who has carefully studied the practical workings of the two methods. As for myself, although the German universities have seemed so far superior to all others that I find myself loth to qualify the high praise I have felt bound to bestow, the conviction has nevertheless fastened itself in my mind that an occasional or even frequent questioning of students by the professors upon the subject-matter of previous lectures, and the adoption of some judicious method of strengthening and elevating the moral influence of the universities and the whole body of their pupils, would render them still more eminently successful in promoting the highest national culture. For, notwithstanding the students have necessarily received much intellectual discipline at the gymnasia, and have been pretty well established in studious habits during their long course of thorough training there, and have, moreover, been systematically drilled in the dogmatics of religion, they are, in general, only youths when they enter the university, and not unfrequently prove themselves not to have been sufficiently well-grounded in the best intellectual habits and in the principles of a true manly virtue to warrant the very abrupt transition they undergo in passing from the drill and restraint of the public school to the almost absolute freedom of the university. Certain it is that there is much idleness and fast living among German students of the less ambitious and more independent classes, and much less respect for things in the highest and best sense spiritual than is essential to their own individual well-being or the earliest realization by the nation of a true Christian civilization. The rioting, drunkenness, gambling, dueling, and other flagrant outrages upon individual and university honor and upon the peace of neighborhoods, so shamefully frequent a hundred years ago, and which, by some ill-informed or unscrupulous writers, are occasionally charged as being common even now, are very rare occurrences, and, when occurring, meet with summary and condign punishment. It is undeniable, however, that excessive beer-drinking, smoking, gaming, and other practices of the less heinous, though by no means harmless, character, are still quite too common in nearly all the universities not to demand the serious consideration of all whose privilege and duty it is to devise and enforce means promotive of the best interests, educational and moral, of the 20,000 to 30,000 students who annually attend them and of the great community of the nation.

The immediate reward that lies at the end of the university course is the doctorate. The degree of licentiate (corresponding, as marked in

another place, to our master's degree) is also given in theology and philosophy, but is seldom sought. Each faculty examines its own candidates and confers its own degrees. For the doctorate there are necessary a certificate of university studies, showing that the candidate has attended the required courses of instruction, an oral examination, a dissertation written in either German or Latin, and payment of the graduating fee, which varies in amount from $80 to $110, but which, in the case of poor, especially meritorious, students, is sometimes remitted.

Thus provided with universally recognized evidence of due preparation for their professional duties, the doctor of philosophy, of law, of medicine, of theology, of natural science, of mathematical and physical sciences, or of political economy, may enter the public service—in Germany each one of the professions, including public instruction, is treated as a branch of the public service—or devote himself still further to the exclusive pursuit of knowledge.

Thus far I have spoken of the general features of the German universities as a whole. Of their present condition, as to support and patronage, and of their relative prosperity, as compared with each other and with the average standard, a brief account is also demanded.

AUSTRIAN UNIVERSITIES.

Austria, though first to follow the example of France, Italy, England, and Spain, in the establishment of universities, has not, during the long period of more than five hundred years since the foundation of the University of Prague, succeeded in keeping the lead. Still her present position is more in harmony with the true university ideal than any hitherto held by her; for while her leading institutions have for centuries maintained a full faculty organization, and one of them—the University of Vienna—has possessed, and now possesses, one of the most complete and most numerously attended medical faculties in the world, it is, nevertheless, undeniable that, until within the present century, none of the Austrian universities have risen to an appreciation of the highest office to be fulfilled by them—the cultivation of true science. The *Brodstudien*, as the German scholar denominates all such studies as aim chiefly at a life-support, had occupied them mainly from the date of their foundation. And even yet the *philosophische Facultät*, in most cases, enjoys less than its legitimate share of attention.

Since the loss of Padua, now at last restored to Italy, Austria possesses nine universities, so called, viz: those of Vienna, Prague, Pesth, Innsbruck, Gratz, Lemberg, Cracow, Linz, and Olmütz. The last two are incomplete, however, (containing less than the four regular faculties,) and are sometimes omitted from the enumeration. The faculties of theology and of philosophy bear the usual German designation, but the faculty of law adds political science, and is entitled *Rechts-und Staatswissenschaftliche Facultät*, while the medical is known as the medical and surgical faculty. The medical faculty is the most prominent of the four faculties in Austria, having more nearly than the rest approached eman-

cipation from that oppressive governmental and clerical control which has so long cramped them and hindered their development. It almost invariably has a larger instructional force, and is more numerously attended; though of late years, at Vienna, the students of law have often outnumbered those of medicine. It has also, as before remarked, a longer period of study (five years) than the other faculties.

Vienna is the scientific and literary Paris of the Austrian Empire, and its university holds a prominence and pre-eminence corresponding to that of the *Acadmie de Paris.* In its theological faculty there are 11 professors and 2 *Adjuncten;* in the law faculty, 20 professors and 5 *Privat-docenten;* in the philosophical faculty, 32 professors, 21 *Privat docenten*, and 7 *Assistenten;* in the faculty of medicine and surgery, 35 professors, 39 *Privat-docenten*, 19 *Assistenten*, and 12 pupil *Assistenten* in the various *Operations-Instituten;* the grand total of the instructional force being 193, of which number, it will be observed, medicine and surgery have nearly one-half.

The number of students inscribed upon the register of the University of Vienna is usually about 3,000. In 1865 the distribution by faculties was as follows:

Faculty.	Winter semester.	Summer semester.
Theology	256	248
Faculty of law and political science	1,082	1,019
Faculty of medicine and surgery	859	811
Faculty of philosophy	380	342
Pharmaceutical branch of medical faculty	141	127
Of extraordinary auditors, (*ausserordentliche Hörer*)	356	307
Totals	3,074	2,854

In the matter of examinations, Austria is an exception to the other German States, her practice in this respect being decidedly more English than German, and the result being scarcely more favorable upon the intellectual development and real progress of her students. The fault does not lie in the fact that the students are often examined, but in the fact that the real use of examinations is now, after so many years of mechanical routine, so far misapprehended that the studies are too often pursued more with a view to the examinations than for their own sakes.

We may presume, however, that with the improvements now making in nearly every department of public instruction in Austria the universities, which should be the sources of intellectual life, will not be overlooked.

UNIVERSITY OF MUNICH.

The universities of Bavaria are nobly led by the University of Munich, which, for the fame of some of its professors, the high character of its instruction in all departments, and the extent and value of its

auxiliary establishments, stands among the very finest institutions of Germany.

The faculty of theology has ten professors and teachers, with the learned and distinguished Dr. Döllinger (who, at the date of my visit, in 1867, was also rector of the university) at its head. The law faculty has 12 ordinary professors and 4 *Privat-docenten*, including many of the ablest jurists of the kingdom. The faculty of political economy has 8 professors, 1 lyceal professor, and 1 *Privat-docenten;* the faculty of medicine, 16 ordinary professors, 2 extraordinary professors, 9 honorary professors, and 11 *Privat-docenten;* and the faculty of philosophy, with the peerless Baron Liebig at its head, has 28 ordinary, 7 extraordinary, and 5 honorary professors, with 9 *Privat-docenten*, and 2 readers; in all, 113 professors and other teachers.

The library of the university includes 16,000 volumes, besides which access is easily gained by professors to the royal library, containing 800,000 printed volumes and 19,000 valuable manuscripts, and, among the numerous scientific establishments, referred to as auxiliaries, the physical and mathematical cabinet; the pharmaceutical institute; the laboratories for physiological chemistry, physiological physics, and agricultural chemistry; the mineralogical, technological, and surgical cabinets; and the anatomical, zoological, and botanical collections, together with the collections of copperplate engravings, pictures, coins, and medals, are among the most extensive and valuable in Europe. There are also more or less intimately connected with the university, and available for its uses, an antiquarium, an observatory, the chemical laboratories of the royal-general conservatories, mathematico-physical, geological, mineralogical, zoologico-zootomical, and anatomical and ethnographical collections, a botanical garden, a general and many local hospitals.

The number of students during the first semester of 1867 was 1,191, distributed among the several faculties and special courses, as follows:

Faculties, courses, and students in 1867.

Faculties and courses.	Natives.	Foreigners.
Students of theology	92	13
Students of jurisprudence	467	43
Students of financial science	2	2
Students of forestry	7	.....
Students of medicine	186	36
Students of pharmacy	36	15
Students of philology and philosophy	249	26
Students of chemistry, technology, &c	11	6
Total of native and foreign students	1,050	141

ROYAL UNIVERSITY OF WURTEMBERG.

The Royal University of Wurtemberg, at Tübingen, has been already referred to as embracing the largest number of faculties of any of

the German universities, and as being further distinguished by having two faculties of theology; I might almost have said four.

So marked is the theological side of this institution that, although the several other faculties are provided with able professors and annually draw to them considerable numbers of students, it might nevertheless, with some propriety, be called the theological university. The theologies taught are the Evangelical, Catholic, Greek, and Hebraic, though the last two can hardly be said to constitute regular faculties. The number of professors and students in the several faculties during the first half-year of 1867 will appear in the following table:

Number of professors and students in the several faculties, 1867.

Name of faculty.	Ordinary professors.	Extraordinary professors.	Privat-docenten.	Students.
Evangelical theology	5			228
Catholic theology	6	1		102
Greek theology	1			1
Hebrew theology	1			1
Jurisprudence	5	2	1	70
Medicine and surgery	6	1	6	103
Philosophy	9	5	6	83
Political science	5	1	1	68
Natural science	7	3	2	100
Totals	45	13	16	756

The magnificent library of between 300,000 and 400,000 volumes is a surer defense for the old town of Tübingen and the beautiful and fertile kingdom in the midst of which it stands, than was ever the commanding old castle it now occupies, and the various collections, botanical garden, and laboratories, &c., near by in the lower town, are also valuable aids to the high order of instruction there given. The University of Wurtemberg is the crowning institution of an excellent public school system, and one of which the government and people are justly proud.

UNIVERSITY OF HEIDELBERG.

Baden is better known to us in this country, and to the world in general, for its grand old University of Heidelberg than for anything else. Scarcely any university in Europe can present a more brilliant array of great names in the various departments of learning than is presented by the register of its professors. Schwarz, Paulus, and Umbreit, of the theological faculty; Mittermaier, Vangerow, Thibaut, and Rau, of the faculty of law; Chelius, Gmelin, Bunsen, Tiedeman, Schlosser, Baer, and Creuzer, of the faculties of medicine and philosophy—all names cherished by the lovers of science and learning in all countries—have, in turn, each added luster to its early fame. The present number of professors and other teachers is 80; of which 31 are ordinary professors, 20 professors extraordinary, and 29 *Privat-docenten.* The number of

students is about 600; the faculties of law and medicine having 240 and 150 respectively, and the remaining number being about equally divided between the faculties of theology and philosophy. The professors are among the ablest and best paid in Europe; some of them receiving an income from fees, endowments, and state appropriations scarcely less than $8,000 per annum.

The scientific establishments connected with the university are: a museum of natural history, physiological, geological and mineralogical cabinets, chemical laboratories, a botanical garden, a college of agriculture and forestry, an observatory, and a number of seminaries—theological, philological, pedagogical, &c. The library contains some 200,000 volumes, with over 2,000 manuscripts, and is considered one of the richest university libraries in Germany.

UNIVERSITY OF GIESSEN.

Hesse-Darmstadt has long been provided with university instruction at the University of Giessen, now just two hundred and sixty years old. Previous to 1851 it had a large number of professors and students, having been brought to a world-wide distinction by the brilliant discoveries of Baron Liebig in the department of organic chemistry. But in that year, the removal of the Catholic faculty of theology considerably lessened the number of professors and students, and the subsequent removal of Baron Liebig to Munich, in the following year, was a yet severer blow to its prosperity. At present it has 47 professors and teachers, of whom 33 are ordinary, 3 extraordinary, and 11 *Privat-docenten*, and nearly 400 students; much the largest number being in the philosophical faculty, the next largest in the faculty of medicine, and the smallest number, usually about fifty each, in the faculties of law and of Protestant theology. It possesses a large museum, a botanical garden, an astronomical observatory, and a library of about 40,000 volumes.

UNIVERSITY OF JENA.

The Saxons all in common enjoy the possession of the famous University of Jena, whose career of more than three hundred years has been signalized by the services of so many of the ablest scholars of Germany, and whose throng of students (2,000 to 3,000) during the eighteenth century made it an acknowledged center of profound learning for all the German states. Striegel, the philologist, and Schröter were among the first lecturers, and powerfully contributed to the great prominence it so early attained. Soon after the promulgation of the new philosophy of Emanuel Kant and its espousal and promulgation at Jena, by Rheinhold, the university became, as none other in Europe, the seat of modern philosophy, as taught by Fichte, Schelling, and Hegel, all of whom were professors there; and soon, also, through the connection therewith of the poets Schlegel, Voss, and Schiller; of Göttling, Döbereiner, and Oken, distinguished in the departments of

chemistry and natural history; of Thibaut and Feuerbach, in jurisprudence; and of the theologians, Paulus, Griesbach, and others, a luminous source of literature and science, as well as of æsthetical and biblical criticism. Owing to the injurious influences growing out of the political disturbances of 1814 to 1820, in which the students of Jena became considerably involved, the university not only ceased to grow in prosperity, but so far declined in relative attractions, especially after the rise of the great luminary at Berlin, that it now numbers but 500 students. Still it is, in fact, worthy of being ranked among the foremost institutions of Germany; embracing, as it does, in its corps of 62 teachers of various grades, many distinguished men in the four faculties; possessing a library of 200,000 volumes; extensive anatomical, geological, mineralogical, and archæological museums, excellent chemical and physiological laboratories, and a botanical garden; and having, moreover, in intimate connection with it an agricultural school with the distinguished Stöckhardt at its head; a school of political science; a school for the natural, mathematical, and physical sciences, and seminaries for philological studies and for theology. The university enjoys a fund of its own that yields 12,000 thalers a year, and it receives from the government of Saxe-Weimar and the neighboring duchies and principalities 46,000 per annum; the fees paid by students being sufficient in amount, together with these sums, to support the institution.

Philosophy is still, as heretofore, the ruling faculty at Jena, as will appear by the following tabular statement of the teachers and students belonging to the several departments:

Number of faculties, professors, and students.

Faculty.	Ordinary professors.	Ordinary honorary professors.	Extraordinary professors.	Privat-docenten.	Students.
Faculty of theology	3	1	2	2	141
Faculty of jurisprudence	5	1	3	1	76
Faculty of medicine	6	.....	1	2	74
Faculty of philosophy	11	7	10	7	203
Totals	25	9	16	12	494

Of the whole number of students 217 are native, and the remainder foreign. It is claimed for this university that its professors, not only in the theological, philosophical, and medical departments, but also in the department of political science, enjoy an unusual amount of, indeed absolute, liberty.

SAXON UNIVERSITY OF LEIPSIC.

The Saxon University of Leipsic, one of the oldest and wealthiest in Germany, still continues to prosper. It was founded in 1409, with lib-

eral endowments of lands and other property, which it still retains, and which now have an estimated value of $3,000,000, and yield an annual revenue of $300,000. It was here that Thomasius first made (in 1687) his bold innovation upon the old order of things, by lecturing and publishing his programmes in the German, instead of the Latin, language, which last, everywhere up to that date, and for some time afterward in all the other universities, was the only medium of instruction. Besides the possession of large estates—in which respect it differs from most other German universities—it is also peculiar in that it still preserves the old college or boarding hall feature, the only other continental remains of which are found at Bologna and one or two other localities. The students do not all live in commons, but a large proportion of them do, and no less than about two hundred have free support. It deserves to be mentioned, moreover, that all public lectures are free; this extraordinary liberality of free tuition and free support for poor students being rendered possible by an annual appropriation from the state of $130,000, which, added to the income from estates, endowment funds, &c., makes the total annual revenue of the university but little, if any, short of $500,000.

From an early period in the history of the institution, philology has been the favorite department of study; and the relative proportion of students who devote themselves specially to it is greater than in any other. And yet the other faculties have always been prosperous, and each one of them can point to a long list of eminent men who, at different periods, have served as professors; though it is a lamentable fact that of the large number of distinguished men who have graced this university and added luster to German letters, science, and philosophy, a considerable number have been forced to retire for want of political tolerance on the part of the government.

The present number of the instructional force, with their distribution by rank and by faculties, is seen below:

Teachers of various grades in the University of Leipsic.

Teachers of various grades.	Theology.	Law.	Medicine.	Philosophy.	Total.
Ordinary professors	6	10	7	22	45
Extraordinary professors	3	10	16	18	47
Privat-docenten	1	1	8	12	22
Public readers				2	2
Teachers and masters of exercise				2	2
Totals	10	21	31	56	118

The fixed salaries of professors range between $500 and $3,000; besides which they realize considerable sums from fees for their private lectures, which, though moderate, ($4 to $10,) in some cases amount to $1,500, thus swelling the total to $4,500.

The whole number of students in attendance during the summer semester of 1867, upon the several faculties and special courses, was as follows:

Number of students in 1867.

	Native.	Foreign.	Total.
Students of theology	181	86	267
Students of jurisprudence	218	146	364
Students of medicine	137	33	170
Students of surgery	2	.....	2
Students of pharmacy	36	9	45
Students of natural sciences	24	27	51
Students of mathematics	16	13	29
Students of philosophy	14	17	31
Students of pedagogy	20	4	24
Students of financial science	10	13	23
Students of philology	39	69	108
Totals	697	417	1,114

The estimated cost of support at this university is from 250 to 1,000 thalers per annum.

The instruction given is amply supported by means of illustration and experiment; including, besides, extensive laboratories, museums, and collections, an observatory and a library of 300,000 volumes, covering the whole field of human learning.

UNIVERSITIES IN PRUSSIA.

Prussia, as remarked at the outset, now has nine complete universities, located at Berlin, Breslau, Bonn, Göttingen, Greifswalde, Halle, Kiel, Königsberg, and Rostock; those of Göttingen, Kiel, and Rostock having been acquired by the late Prusso-Austrian war. They are characterized in general by small endowments, liberal annual appropriations from the state, extensive and valuable equipments, large corps of able professors, the liberty enjoyed by both professors and pupils, partiality for the philosophical studies, thoroughness of scientific culture, a growing appreciation of the claims of industry upon science, and the economical administration of their fiscal affairs.

The annual appropriations to the nine from the state treasury is now about 1,000,000 thalers, of which full one-half goes to Berlin, Bonn, and Göttingen, while the total income from endowments is less than 1,000,000, and from fees not more than one-third of this last amount. This statement conveys a better idea of the high estimation in which scientific culture is held by the government, and of its sound, practical wisdom, in adopting measures for insuring the blessings of such culture to the youths of the country without regard to their station in life, than a volume of wordy eulogy could otherwise give.

My late visits to the universities last above-named, as well as to those

of Halle and Königsberg, gave me particular satisfaction; so that, did the limits of space allow, I would fain devote a chapter to each of them. The magnificent buildings occupied by each, especially those of Bonn, Berlin, and Göttingen; the vast array of their scientific establishments, including museums, cabinets, laboratories, observatories, hospitals, printing establishments, botanical gardens, libraries with hundreds of thousands of volumes—Bonn has 150,000, Göttingen nearly 500,000, and Berlin 600,000—and last, but by no means least interesting and significant of all, their numerous subordinate schools of philology, political and economical science, pedagogy, analytical and technical chemistry, agriculture, and veterinary science; all these are most interesting subjects for consideration, but nothing more than this bare allusion to them in this place is consistent with the plan of my report.

UNIVERSITY OF BERLIN.

Of Berlin, however, as the representative of all Prussian universities, the most perfect embodiment of the German idea of a university hitherto realized, and the most distinguished and influential university now in the world, I must be allowed to write a little more in detail. It originated in an unquenchable desire for intellectual liberty—the acknowledged right and favorable opportunity to fully represent one's own convictions, regardless of their consonance with or their dissonance from all recognized authority. Its establishment in 1810 was effected through the influence of some of the ablest and wisest men of the kingdom, and chiefly in the interest of pure science and the highest intellectual culture. Behold now the result of their labors. It began its career with Wolf, Fichte, Reil, Savigny, and Schleiermacher, each of whom was a shining luminary, shedding abroad the unborrowed light of an independent genius, and at the end of five years the corps of professors and teachers numbered fifty-six, and students had begun to flock to it from all parts of Europe. In the progress of time other clusters of bright stars have been added, including such men as Hegel, Schelling, and Michelet, in speculative philosophy; Marheineke, Neander, and Nitzsch, in theology; Raumer and Ranke, in history; Encke, in astronomy; Ohm and Jacobi, in mathematics; Jungken, Müller, Schönbein, Dieffenbach, and Langenbeck, in medicine; Boeckh, Bopp, Zumpt, the Grimms, Gerhard, and Rückert, in philology; and Humboldt, Lichtenstein, Mitscherlich, Schubarth, Dove, Hofmann, and Ehrenberg, in the natural sciences; until thus, within fifty years, the new university of Berlin has become the most brilliant constellation in the whole firmament of university history.

The present number of professors and *Privat-docenten* is 180; of students, about 2,500; of whom not less than 500 are drawn from all the various enlightened countries on the globe.

Independence of thought and freedom of speech, though at times in danger of serious infringement, are still the privilege of all who teach.

Many of the great ones have long since ended their labors, but their names and fame are an imperishable and precious legacy; and, in many instances, their mantles have fallen upon others scarcely less worthy to wear them. One still finds there the learned Nitzsch, eloquently discoursing on ecclesiastical history and the Epistles of Paul; a score of able jurists, but little less distinguished than Savigny and Gans, laying down the principles of political philosophy and of the civil and canonical law; the authoritative Boeckh, Bopp, and Gerhard, and many others of equal rank, discoursing upon the origin, relations, and development of all the languages of the babbling earth; the venerable and fearless Ranke, dealing as a true philosopher, statesman, and Christian with the histories of nations and of the church; the masterly Ohm, so easily solving the most difficult problems of mathematical analysis; the searching and scientific Dove, sustained by the equally able and now no less distinguished Hofmann and others, unfolding the laws of chemical force; the far-famed Ehrenberg, startling even the multitude of scientific investigators of all lands with his marvelous revelations of the microscopic world; the learned and skillful Mitscherlich and Langenbeck, leading the way to a true science of medicine and surgery; and the redoubtable Michelet, as unweariedly as ever, enforcing his philosophy of life. And these are only the standard-bearers of the host of learned professors and enthusiastic students who so nobly sustain and eagerly press after them in the grand intellectual march of the age.

I have translated a full enumeration of the subjects of the nearly four hundred distinct courses of lectures given in this great *Friedrich-Wilhelms Universität* of Berlin during the winter semester of 1866–'67, and the summer semester of 1867, and feel strongly tempted to embody it entire, that my readers of this country may the more easily realize how thoroughly the whole realm of science, letters, philosophy, and religion is annually overrun and explored by this grand army of the republic of learning. But the length to which this portion of my report has been already carried warns me to bring it to the speediest possible conclusion, and I shall, therefore, simply include the titles of the courses actually given during the first half of said year, together with the amount of time per week given to each; so assorting and arranging them that the relative numerical strength of faculties and of the different classes of teachers will, at the same time, appear.

Courses of lectures at the University of Berlin.—The following is a presentation of the titles of distinct courses of lectures delivered in the several faculties of the University of Berlin during the winter semester of 1866–'67, with the number of hours per week devoted to each:

In the faculty of theology.—By ordinary professors: Special dogmatics, six hours a week; theology of the New Testament and life of Christ, five hours; God's Kingdom till the coming of Christ, one hour; introduction to the books of the Old Testament, five hours; explanation to

the Psalms, five hours; life of Christ, and critical history of the gospels, two hours; history of the Church of the Reformation, six hours; exercises in catechization and preaching, two hours; the same, two hours; practical theology, five hours; the creeds, one hour; symbolical theology, and introduction to the criticisms of the New Testament, five hours.

By extraordinary professors: The Book of Judges, one hour; the Book of Genesis, five hours; life and doctrine of Saint Paul, one hour; the Epistle to the Romans, five hours; the circle of knowledge and methodology, two hours; church history, part 1, five hours; archæology and patristic study, one hour; homiletics, theoretical and practical, two hours; biblical history, four hours; dogmatics, one hour; the Book of Isaiah, six hours; introduction to the books of the Old Testament, five hours.

By *Privat-docenten.* The Book of Genesis, five hours; prophetical inspiration, two hours; the Book of Isaiah, five hours; Chaldaic and Syriac grammar, two hours; three of Saint Paul's epistles explained, two hours; history of the Christian dogmas, five hours; symbolical theology, one hour; the dogmatical passages in the Old and New Testaments explained, five hours; history of the Christian dogmas, five hours.

In the faculty of law.—By ordinary professors: Psychology of crimes, one hour; natural law, philosophy of law, four hours; criminal law, four hours; criminal procedure, two hours; law of nations, two hours; private German law, commercial law, five hours; practical exercises, one hour; the Pandects, one hour; practical law of the Pandects, six hours; history of English law, one hour; Roman law of inheritance, two hours; common and Prussian civil process, four hours; German and Prussian public law, four hours; canon law, four hours; Prussian law, one hour; metrodology of law, three hours; Prussian civil law, four hours; history of the German Empire and German law, four hours; history of the provincial estates in Germany, three hours; the fourth book of Gaius explained, two hours; history of Roman law, five hours; institutes and antiquities of Roman law, five hours.

By extraordinary professors: History and actual state of the German Confederation, three hours; common law of Prussia, four hours; French civil law, four hours; Catholic and Protestant law of marriage, one hour; Prussian civil law, four hours; Catholic and Protestant canon law, four hours; ecclesiastical and canon law, four hours; practice of ecclesiastical and canon law, one hour; capital punishment, one hour; common and Prussian criminal law, four hours; French criminal procedure, two hours; German public law, rights of sovereigns, two hours; law of nations, three hours; practical exercises in the criminal law, one hour.

By *Privat-docenten:* Prussian law, one hour; history of Roman law, one hour; institutes and antiquities of Roman law, four hours; Prussian civil law, four hours; feudal law, one hour; private German law, one hour; commercial law, maritime law, and law of exchange, four hours;

history of Roman law in Germany, one hour; history of the empire and of German law, four hours; Prussian law of succession, one hour; practical exercises on the jurisprudence of the Pandects, one hour; institutes and antiquities of Roman law, five hours; relations between church and state, one hour; ecclesiastical and marriage law, four hours; German public law, private rights of sovereigns, two hours; Prussian public law, three hours; practical exercises on public and canon law, one hour; private justice among the Romans, two hours; Roman law of succession, three hours; modern law of exchange in Germany, one hour; private law and feudal law in Germany, four hours; commercial and maritime law in Germany, four hours; the *Speculum Saxonicum* explained, two hours; history of the empire and of German law, four hours; interpretation of the solutions in the digests, one hour; metrodology of law, three hours.

In the faculty of medicine.—By ordinary professors: On certain discoveries of the naturalists, one hour; experimental physiology, five hours; practical exercises in experimental physiology, one hour; comparative physiology with the microscope, one hour; general history of medicine, one hour; pathology and therapeutics, three hours; clinical medicine, six hours; diseases of the nervous system, five hours; medical practice, six hours; history of popular maladies, one hour; general history of medicine, three hours; pathology and therapeutics, five hours; hernia, two hours; general and special surgery, four hours; clinical surgery and clinical ophthalmia, five hours; experiments in surgery and anatomy, ——; clinical surgery and clinical ophthalmia, six hours; midwifery, four hours; clinical midwifery, six hours; practical exercises in midwifery, one hour; excitant drugs in medicine, two hours; materia medica, six hours; osteology, one hour; anatomy of the brain and spinal marrow, one hour; general anatomy, six hours; structure of the human body, with the microscope, one hour; practical exercises in anatomy, four hours; methodology of medicine, two hours; general pathology and therapeutics, and their history, four hours; materia medica, with experiments, six hours; pathological anatomy, four hours; practical course of anatomy and pathology, with the microscope, six hours; practical course of pathological osteology, six hours.

By extraordinary professors: Spectacles, one hour; ophthalmology, two hours; the same, two hours; clincial ophthalmia, six hours; practical course of ophthalmia, with experiments, one hour; general surgery, six hours; surgical operations on dead bodies, ——; diseases of children, six hours; errors of modern medicine, one hour; hygiene, one hour; theory and practice of treatment of diseases of the eye, four hours; anatomy of the organs of sense, one hour; osteology and syndesmology of the human body, three hours; public hygiene, one hour; legal medicine, three hours; medico-legal dissection, six hours; the nerves, two hours; clinical study of diseases of the nerves, six hours; toxicology, two hours; legal medicine, three hours; medico-legal dis-

section, six hours; pathology and therapeutics, one hour; auscultation, four hours; clinical lectures on auscultation and percussion, six hours; wounds, one hour; fractures and dislocations, two hours; application of bandages, three hours.

By *Privat-docenten:* Diseases of the teeth and mouth, two hours; diseases of the teeth and their cure, with experiments, six hours; surgical and ophthalmological experiments, ——; drawing up of prescriptions, two hours; special pathology and therapeutics, six hours; venereal diseases, two hours; cutaneous diseases, two hours; clinical lectures on diseases of children, two hours; diseases of the ear, one hour; moral responsibility, one hour; pathology of venereal diseases, one hour; surgery, six hours; legal medicine, two hours; diseases of women, two hours; theory and practice of midwifery, four hours; baths and thermal waters, two hours; drawing up of prescriptions, three hours; physiological effects of gases, three hours; toxicology, three hours; going over previous lectures in physiology and osteology, one hour; theory and practice of midwifery, four hours; operations in midwifery, one hour; clinical study of cutaneous and venereal diseases, three hours; use of the laryngoscope, one hour; diseases of the heart, one hour; percussion, auscultation, &c., three hours; auscultation, percussion, and use of the laryngoscope, four hours; general and special surgery, ——; physiology of animal generation, one hour; physiology of the nerves and muscles, four hours; hernia, one hour; puncture, with experiments, one hour; hereditary vices, one hour; general and special surgery, four hours; auscultation, percussion, &c., one hour; diagnostics, two hours; use of electricity in medicine, one hour; experimental physiology, two hours; going over previous lectures on different points of physiology, one hour; ophthalmology, three hours; use of the ophthalmoscope, one hour; diagnostics, abnormal states of the eye, one hour; theory and practice of midwifery, four hours; operations in midwifery, one hour; thermal waters, two hours; going over previous lectures on pharmacology, one hour; position of the viscera in the human body, one hour; the laryngoscope, one hour; the laryngoscope, auscultation, inhalation, &c., one hour; cure of insanity, the diseases of the brain, two hours.

In the faculty of philosophy.—By ordinary professors: Æschines in Ctesiphontem, two hours; paleontology, five hours; Greek antiquities, six hours; botany, one hour; special botany, four hours; cryptogamia, &c., one hour; meteorology, one hour; experimental physics, four hours; Grecian history, four hours; modern history from 1780 to 1815, five hours; archæology, two hours; Greek mythology, one hour; national economy, four hours; science of finance, four hours; the Persæ of Æschylus, four hours; the *Miles Gloriosus* of Plautus, four hours; politics and political economy, one hour; principles of political economy, four hours; logic and metaphysics, four hours; political economy; theory of finance, four hours; organic chemistry, one hour; experimental chemistry, three hours; the Speeches of Lysias, two hours; the Homeric

Poems, and particularly the Odyssey, four hours; surfaces of the fourth order, one hour; analytical mechanics, four hours; history of Egypt, one hour; grammar of hieroglyphics, three hours; explanation of Egyptian monuments, one hour; physical experiments, one hour; the forty-first book of Livy and onward, one hour; Latin inscriptions, four hours; monuments of the ancient German language explained, one hour; history of the ancient poetry of Germany, four hours; the Germany of Tacitus, four hours; analysis of determinate numbers, three hours; general and special geology, six hours; zootomy, four hours; historical exercises, one hour; modern history of England and of her Parliament, four hours; history of politics, one hour; the Syriac language, one hour; grammar of the Semitic languages, one hour; explanation of the Psalms, five hours; principles of Arabic grammar, three hours; comparison of Persian with Sanscrit, one hour; crystallography, one hour; mineralogy, six hours; the sixth book of Aristotle's Nicomach Ethics, two hours; psychology, four hours; history of philosophy, five hours; theory of analytical functions, six hours; algebraical equations, six hours.

By extraordinary professors: History of modern philosophy, two hours; logic, four hours; general history of philosophy in seventeenth century, four hours; theory of determinates, two hours; algebra, four hours; differential calculus, four hours; physical geography and history of the Mediterranean, three hours; simple drugs examined with the microscope, one hour; botany of medical plants, six hours; pharmacognosy, four hours; certain Arabic authors explained, one hour; Arabic grammar, three hours; the Book of Genesis, five hours; theory of geographical phenomena, three hours; analytical mechanics, one hour; history of astronomy, two hours; theory of the motion of planets and comets, four hours; exercises in archæology, one hour; history of Greek sculpture, three hours; national economy, four hours; the Epidicus of Plautus, two hours; Roman antiquities, four hours; history of Greek philosophy, two hours; æsthetics, two hours; Select Epistles of Cicero, one hour; philological exercises, one hour; Greek mythology, three hours; exercises in paleography, one hour; Latin paleography, one hour; national history of glumaceous plants, one hour; systems of medical plants, six hours; exercises in anatomy and physiology, four hours; ancient geography, three hours; botany, diseases of plants, four hours; agronomical science, one hour; historical exercises, one hour; history of Germany, four hours; art of singing, especially church singing, two hours; musical composition, four hours; pedagogy, two hours; the Nibelungen, six hours; exercises in deciphering manuscripts, one hour; logic, encyclopedia of philosophical sciences, four hours; history of philosophy, four hours; history of the New World, two hours; geography and ethnography of Europe, four hours; the Chaldee language, one hour; history of the Armenians, one hour; general history of physics since Galileo, two hours; theory of electricity, one

hour; physics applied to mathematics, acoustics, four hours; chemical metallurgy, three hours; principles of qualitative and quantitative analysis, one hour; experimental chemistry, six hours; pharmacy, three hours; chemical experiments, eight hours daily; the Turkish language, three hours; principles of national psychology, one hour; philosophy of language, general grammar, four hours; character of the Indo-Germanic languages, four hours; universal history of the arts, five hours; the Sacontala of Calidâsa, two hours; Sanscrit grammar, three hours; Zend, or Pâli, grammar, two hours; the Rigveda, or the Atharvaveda explained, one hour; course of Sanscrit, Zend, or Pâli, one hour; the dramatic art, one hour; psychology and anthropology, three hours.

By *Privat-docenten:* Experimental organic chemistry, four hours; experiments in organic chemistry, six hours; Schleiermacher, one hour; logic and encyclopedia of the philosophical sciences, four hours; the limits between poetry and philosophy, one hour; the American Political Economist, Henry Carey; logics and metaphysics; political economy; history of modern civilization; agronomical zoology, three hours; entomology, three hours; the Koran, two hours; the Semitic dialects, one hour; differential calculus, four hours; analytical geometry, four hours; the Bhagvatgita, one hour; Panini's Sanscrit grammar, three hours; Hindustani, or Pâli, grammar, two hours; Indian philosophy, one hour; the Satires of Juvenal, two hours; syntax of the Latin language, four hours; Lucretius, *De Rerum natura*, one hour; rhetoric and rhetorical exercises, two hours; Aristotle and the natural philosophy of the ancients, four hours; history of the German universities, one hour; systems of modern philosophy since Kant, four hours; experimental chemistry, six hours; the Olynthiac orations of Demosthenes, one hour; the Epistles of Horace, four hours; physics applied to mathematics, acoustics, optics, &c., three hours; general geology; natural history of *Entozoa*, one hour; general zoology; the climate of Italy, one hour; medical climatology, two hours; conversational lecture on chemistry, one hour; history of chemistry, one hour; qualitative and quantitative part of analytical chemistry, three hours; medico-legal chemistry, three hours; chemical experiments, eight hours daily; theory of irrigation and drainage, one hour; principles of agriculture, three hours; management of cattle, three hours; book-keeping, one hour.

By *readers*, (for modern languages:) Lectures in Italian on Italian literature, two hours; Italian grammar, two hours; lectures on the Italian and French languages, two hours; German short-hand, two hours; German, English, French, and Italian short-hand, two hours; lectures in Polish on Persian grammar and the Zend language, two hours; the Turkish language, Kirk Vezir read, three hours; practical lectures on the Persian and Turkish languages, two hours; lectures in English on English literature down to the sixteenth century, one hour; lectures on the English language, two hours.

But this magnificent array of courses of instruction does not complete a fair representation of the facilities afforded by the University of Berlin; they are sustained by material aids no less remarkable. The royal library, with over five hundred thousand volumes, and the special university library, for the exclusive use of professors and students, of over one hundred thousand volumes, are daily open to all members of the university, and the astronomical observatory, botanical garden, extensive anatomical, zootomical, and zoological, geological and mineralogical museums and collections, collections of surgical instruments and bandages, various chemical, physical, and physiological laboratories, full pharmacological collections, the collections of charts of the Royal Chartographical Institute, a rich collection in Christian archæology, the museum of arts, collections of plaster casts, &c., are likewise always accessible, as occasion requires, and to students of all classes, on application to the proper authorities; while, for the department of medicine and surgery, there are: the anatomical theater and physiological laboratory, the medico-surgical polyclinical institute, the clinic for surgery and the treatment of the eye, and the obstetrical clinic and the polyclinics, all in the great *Klinikum* of the univerity, the university clinic at Charity Hospital, numerous general medical and surgical clinics, a surgical operative clinic for the special benefit of students of eye surgery, a clinic for the treatment of syphilitic diseases, a clinic for the treatment of lying-in women and their infants, and, finally, the pathological institute and the institute for practical exercises in medical jurisprudence at Charity Hospital. The Royal Veterinary School at Berlin and the Agricultural School at Potsdam are also now connected with the university and afford excellent facilities for either the incidental or thorough special study of the sciences they were designed to promote.

SUPPORT OF THE UNIVERSITY OF BERLIN.—For the support of the University of Berlin there is annually expended the sum of about 200,000 thalers, or $150,000. The exact amounts received and expended in the year 1865, with the sources thereof and the general objects to which they were applied, will appear by the following statement:

	Thalers.
Received from the state	189,069
Received from endowments	50
Received from students as fees	7,557
Received as interest of capital	111
Total	196,787
Expended for administration	10,804
Expended in salaries	102,400
Expended upon university establishments	70,230

	Thalers.
Expended in aid to students	350
Expended in repairs and taxes	2,000
Reserve	11,003
Total	196,787

After a glance at the above figures one hardly knows which most to admire, the munificence of the government in annually bestowing upon a single one of its nine universities the sum of over $141,000, or the economy of an administration through whose management so vast an institution is so well sustained. It must not be forgotten, however, that these figures do not represent the amount actually consumed in the education of the twenty-five hundred students who attend upon its courses of instruction. Besides the 7,557 thalers paid as regular fees for courses of public lectures not entirely free, they also pay in the aggregate very considerable sums for the great number of private courses delivered by both professors and *Privat-docenten*. It is these fees for extra lectures, voluntarily attended by ambitious students, that swell the 102,400 thalers above mentioned as salaries of professors to an amount sufficient for their comfortable—in some cases, very handsome—support.

As it regards the support of the professors and teachers, it should also be remarked that very many of them derive incomes more or less large from their published works, of the number of which we have in this country but a very imperfect idea, owing to the very different conditions of professorial life here and there.

SWISS UNIVERSITIES.

The universities of Switzerland are of a type so essentially German and, as compared with the great institutions just reviewed, possess so little importance that I feel warranted in passing them with a very brief notice.

Being German in constitution, in the general character of their instruction, (which is also chiefly given in the German language,) in the nationality of their professors, most of whom were educated in German institutions and many of whom are actual natives of the German States, transplanted to the Swiss soil for the benefit of their superior culture and scientific spirit, it is not because of any serious defect in themselves that they hold a position of so little relative importance among the universities of Europe. On the contrary, the true reason seems to be found in the lower university ideal as cherished by the Swiss nation. The Swiss are, in the popular sense, a well educated and a universally educated people, as I have incidentally shown in previous chapters, but they are neither a highly educated people nor appreciative, as a large body of the Germans are, of the real value of the highest culture. Not

that they are without the capacity to appreciate it, but that they are now pre-eminently practical in their aims and have not yet fully entered upon the higher stage of national development. Their philosophy is still of the mechanical sort, so to speak, and cannot, therefore, yield large intellectual results. They maintain excellent common schools, which, however, show marked realistic tendencies, and they are building up a grand *Polytechnikum*, which, even now, within thirteen years from the date of its foundation, is beyond the rivalry of any and all institutions of its kind except the famous *badische polytechnische Schule* of Carlsruhe. But all these are plants which, when once rooted, have a rank and easy growth, belonging rather to the carboniferous period, so to speak, of the educational development of an industrial nation, whereas the true university demands a purer atmosphere, and must of necessity wait a little longer for its healthiest growth and most perfect development.

The three Swiss universities are located at Basel, Bern, and Zurich. They are all cantonal rather than national, and, in equipment, support, and patronage, barely occupy a respectable position among the third-rate universities of the continent. They are supported by the cantons where located. The teachers—here, as in Germany classified as ordinary professors, extraordinary professors, and *Privat-docenten*—are appointed by the council of state on the nomination of the council of education; the church council having also a voice in the nomination of theological professors. The ordinary and extraordinary professors of each faculty annually elect one of their own number dean of faculty, and the four deans thus elected, together with the ordinary professors constitute the *senatus academicus*, which is the governing body of the university, as to all matters of instruction and discipline, with the right to be heard before the education council can make any change in the general regulations, and which, subject to the approval of the council of state, has also authority to choose a rector for the immediate execution of its will.

The standard number of professors is five for each of the faculties of theology, law, and medicine, and fourteen for the faculty of philosophy; though actually the number varies a little in the several cases, and is in all somewhat higher. The number of the *extraordinarii* and *Privat-docenten* at Zurich is nearly equal to that of regular professors; while Bern and Basel, having less power to attract teachers of these classes, are pretty much without them. The number of students ranges between one hundred and three hundred; the largest number being found at Zurich.

The Zurich University, more commonly known as the *Hochschule*, is peculiar in that it exists in connection with the great polytechnic school, occupying a portion of the same magnificent new edifice, and both giving and borrowing instructional service. Thus far the fruits of this intermarriage have been of mutual advantage and great general satisfaction. The intellectual activity and energy so strongly characterizing the

Polytechnikum has awakened new life in the *Hochschule* and the pure love of culture for its own sake, the *wissenschaftliche Geist* of the *Hochschule* has a perceptible influence in raising the standard and elevating the tone of the *Polytechnikum*.

In view of all the elements involved, I feel safe in predicting a gradual rise and a future highly honorable position for Swiss university education.

UNIVERSITY EDUCATION IN HOLLAND.

The first Dutch university, the University of Leyden, was planted by the Prince of Orange in token of his gratitude for the rescue of that city from the starvation and destruction threatened by Spanish enemies, and as a reward for the sufferings and heroism of his people. And a noble reward it proved; for although founded as late as 1575, through its influence as a nursery, and the attractions it offered to the learned men of many lands, the seventeenth century had not reached its noon ere Holland was reckoned "the most learned country in Europe," and Leyden received the proud title of "Athens of the West." It was here that were first trained the wonderful powers of a Grotius; where those distinguished philologists of their time, Scaliger, Heinsius, and Gronovius, taught belles-lettres, and wrote their numerous works; where Arminius so successfully studied theology, and afterward, as professor and author, promulgated those religious doctrines which, while they brought bitterness to his life, added luster to the already famous university and connected his name inseparably with the faith of so large a division of the great Protestant Church of the world; where the great Boerhave, most distinguished physician of his time, "the modern Hippocrates," instructor of Peter the Great, both studied and taught by his own genius; so widening the fame of the university as a school of medicine that large numbers of students were attracted to it from all parts of Europe; and upon whose now venerable register a long list of names eminent in every department of learning—a list far too long for enumeration here—are found inscribed.

The other two Dutch universities are located at Utrecht and Groningen. Though both established early in the seventeenth century, and both somewhat distinguished, Utrecht more especially so, they neither of them have ever attained to anything like the celebrity of Leyden. In the form of their organization all three were modeled after those of Germany, and they are still strikingly like them. They have five faculties, however, instead of four; the faculty of philosophy being divided into the faculty of letters and theoretical philosophy (*facultas philosophiæ theoreticæ et literarum humanorum*) and the faculty of mathematics and natural philosophy. The professors are almost exclusively of one class; extraordinary professors being rare, and *Privat-docenten* (here known as readers, *lectores*) rarer still, and the instruction is almost wholly given in the Latin language. In the last-named particular they

afford a striking illustration of the tenacity and obstinacy of the Dutch mind. As when blockaded and besieged, the people would perish of famine and pestilence rather than surrender, so having organized their universities at a time when in all countries university lectures were of necessity given in Latin because there was no other learned language, they still persist in the practice although all other European institutions abandoned it more than a hundred years ago; and though their own language has meantime attained to a high degree of perfection. It was my good fortune to be present at both Utrecht and Leyden on the occasion of their commencement days, and throughout all the exercises, including graduating discourses and their discussion and criticism, by members of the examining boards, addresses baccalaureate by the rectors, &c., I heard no single word but Latin. And it is worthy of remark that not only was the Latin of the written compositions and premeditated discourses of a quite different character from that of the salutatory orations and other productions so commonly heard at our own college commencements, which, as a rule, neither greatly honor the elegant models left by Cicero and Hortensius, nor reflect much credit upon the classic attainments of their authors, but the extemporaneous remarks of these academicians of Utrecht and Leyden seemed as free as in their own flexible, rich, and powerful vernacular.

In such strongholds of classic element, it should be expected that in the association of faculties, letters and the two professions more especially served by letters, viz., theology and jurisprudence, would be the ruling powers. And accordingly we find that, so far as patronage is concerned, such is the case; for of the 541 students at Leyden during the summer term of 1867, 292 were devoted to law, 78 to medicine, 27 to mathematics and philosophy, 42 to letters, and 72 to theology; while at Utrecht nearly 200 are students of theology, and over 200 are in the faculty of jurisprudence.

But then this prominence of the classic element is not here, as in some of the other universities of Europe—especially those of England—preventive, or even repressive, of the newer and now everywhere growing element of modern science. This remark is especially applicable to the University of Leyden, whose faculty of medicine again outnumbers that of theology, and whose *facultas mathesis et philosophiæ naturalis* (*mathesis* here embracing, not only the pure mathematics, but also physical science and practical astronomy, and *philosophia naturalis* not only chemistry inorganic and organic, theoretical and practical, but likewise the whole field of natural history) has the most numerous corps of professors and is supported by a fine array of auxiliary establishments, including a beautiful and extremely valuable botanical garden, some of whose trees were planted by the hand of Linnæus, and which was long esteemed the richest garden in Europe, especially in plants of oriental origin; a splendid new observatory; a new physical laboratory, with a valuable cabinet connected; a new chemical laboratory admirably

arranged and well equipped; a new physiological laboratory; an exceedingly rich cabinet of comparative anatomy; one of the most extensive and valuable museums of natural history in the world; a rich museum of coins and medals; a museum of agricultural implements and products; galleries of statuary and paintings, antique and modern; and a library of nearly one hundred thousand volumes and some fifteen thousand manuscripts, many of them exceedingly rare and valuable. Its students also have easy access to the public herbarium, and to the ethnographical and Egyptian museums. The several new buildings for the library and scientific establishments are substantial and elegant, reflecting much credit upon the intelligence and liberality of the government.

The cost of maintaining the three universities of Holland will appear from the following figures kindly furnished me by the learned rector of Leyden:

For what expended.	Leyden.	Utrecht.	Groningen.
	Florins.	*Florins.*	*Florins.*
Salaries of curators	1,350	1,100	1,150
Salaries of professors	117,420	67,313	64,266
Material	137,872	28,935	41,106
Subsidies for students	.....	.....	3,000
Totals	256,642	97,348	109,456

Students at Leyden pay 30 florins (of 41 cents) for a course of three or more lectures per week for the first year; after that, nothing; for a less number of hours per week, 15 florins. Students of chemistry have free use of the laboratories; students of anatomy for laboratory privileges, 30 florins per annum; students of physiology for the use of the physiological laboratory, 15 florins. For a time after admission all newcomers must play drudge (fag) to the more advanced students—another absurd relic of mediæval times not yet rooted out. The highest salary to ordinary professors is 2,800 florins; the lowest to extraordinary professors, 1,600. At Utrecht the salaries are a trifle lower, and at Groningen still less, owing to the small amount derived from the fees paid by students, who rarely number more than two hundred.

The number of professors in the several faculties is much too small to insure their most successful working; the average per faculty being less than six. At Leyden there are 26 professors—5 in the faculty of jurisprudence, 5 in the faculty of letters and philosophy, 7 in the faculty of mathematics and natural philosophy, 5 in the faculty of medicine, 4 in the faculty of theology, and 3 readers; in all 29. At Utrecht the whole number of teachers is 22; at Groningen, 21. It is impossible that so small a number of professors should occupy the broad field embraced by these universities and cultivate it in all parts thoroughly. But the infusion of new life, as evidenced by the creation of new auxiliary estab-

lishments and the enlargement of old ones, at great expense, is a circumstance of present encouragement, and there is reason to believe that the next step of the government will be to add to the instructional force, until Holland will again be enabled to rank, in the prosperity and greatness of at least its leading university, with the foremost nations of the world.

THE UNIVERSITIES OF BELGIUM.

The Universities of Belgium, like its mixed population, are partly German and partly French; the French element rather predominating.

Two of them—those of Liege and Ghent—are government institutions; one of them—the University of Louvain—is maintained exclusively by the Catholic Church; and the fourth, located at the capital, is a *free* university. None of them are, in the German sense, real universities, but all are quite prosperous, and those of the state are slowly moving in what seems to me the right direction.

Louvain, the oldest of them all, (founded in 1426,) at one time ranked among the leading universities of Europe; having in the sixteenth century as high as six thousand students, grouped, after the early fashion, in forty-three colleges. It has held with much tenacity to most of its original features, and, as judged by its own ideal standard, is still quite prosperous. The library is one of the largest in Belgium, and the museums of mineralogy and zoology, as well as its botanical garden, are highly respectable. The number of faculties is five—letters and philosophy, sciences, law, medicine, and theology; number of colleges, 20; of professors, 49; of students, about 700.

The royal and free universities belong wholly to this century; Ghent having been founded in 1816; Liege, in 1817; Brussels, in 1837. They agree in all essential particulars, so that an account of one would answer very well for all. The characteristic features, as distinguished from those of Germany, are the following: Each of them contains four faculties—those of letters and philosophy, sciences, law, and medicine. Each also embraces a special school of applied science; Liege, a school of mines; Ghent, a school of engineering; and Brussels, a school of pharmacy. The instructors are *professeurs ordinaires*, *extraordinaires*, *honoraires*, and *émérites*, and *docteurs agrégés*. And they, in common, confer the two degrees of *candidat* and doctor upon very nearly the same conditions. They also agree in the main in their regulations relative to the payment of students' fees; payment being made per annum or per full course essential to a degree, instead of per lecture or single course of lectures, as in Germany. The fees are higher than in the German and Italian universities, but lower than in the French; matriculation about 15 francs; fees for all the classes in each faculty, 200 to 250 francs per annum.

The state universities each receive from the government the sum of 350,000 francs per annum; the independent University of Brussels,

moderate aid from the city and province of its location. Liege and Ghent have been provided by the government with much in the way of museums, cabinets, libraries, botanical gardens, &c.; while the University of Brussels finds easy access to the magnificent collections belonging to the city, and is gradually making accumulations of its own.

The University of Liege is rather the more flourishing of the two government institutions; its advantage appearing to be due, in part at least, to the circumstance of its location in the midst of rich mines, easy access to which, on the part of its students, has made its school of mines especially attractive to a large number of influential citizens, and thus secured to it a general and cordial support. The number of its teachers is 60; of its students, including 300 in the school of mines, 750. Its library is one of the most extensive in Belgium.

The University of Ghent derives similar and large advantage from its school of engineering, which adds 200 pupils to the 300 in attendance upon the instruction of the four faculties, thus making a total of 500. The number of professors and *agrégés* is 50. It is provided with new and elegant buildings, and possesses a fine library, well arranged laboratories, and valuable collections for the use of the faculty of sciences and the school of engineers.

The examination of candidates for degrees in the case of the state universities is never by the faculties in whose name they are conferred, but by a board of examiners appointed by the King from among the scientific and learned men of the kingdom, on the nomination of the legislature and ministerial departments—two by the senate, two by the house of representatives, and three by the ministers. This board, aided by under-boards for each of the four faculties, holds regular *concours* at Brussels, and, like the University of London, awards to such applicants as present themselves under regulations affording general guarantees of their claims to an examination; and awards diplomas and degrees to those properly qualified, without regard to the place or other circumstances of their instruction. The degree of doctor, however, can only be conferred upon such as already possess the diploma of *candidat*.

The *free* university of Brussels has regulations somewhat different. The state has nothing to do with it, and it also professes to be free from sectarian bias in the administration of its affairs, the control of which is intrusted to a council of administration of the university, comprising the administrative inspector of the university, the rector, the secretary and treasurer, and with the burgomaster (mayor) of the city as president. The matriculation fee is the same (15 francs) as in the universities of the state, and admission is gained by the fulfillment of other like conditions as to qualification, viz: such attainments in the various branches of a general education as are acquired at the *athenæ* of the country. Upon registering his name upon the roll of the university, each student pays a general fee for all the courses relating to the subject-matters embraced by the examination for the degrees to which

he aspires. This payment secures the right to attend upon said courses until the student has attained the degree for which he inscribed; although this privilege may be withdrawn by the rector, with the advice of the faculty concerned, at the end of the second year. In amount, the fees for the courses requisite to a degree range between 100 francs, for the shortest term and first diploma in pharmacy, to 250 francs for the courses required for the doctorate. Doctors of law who aspire to the special doctorate in the political and administrative sciences must pay, besides the 15 francs, (price of subscription,) a fee of 80 francs; *candidats* in law, 150 francs. The authorities of the university may also allow inscriptions for certain separate and single courses of instruction; in which cases, besides the matriculation fee, each student thus enrolled must pay 80 francs for each course of lectures in the faculty of law, and 60 francs for each course in any of the other faculties.

The diplomas conferred by the University of Brussels are of two kinds, *diplômes honorifiques* and *diplômes scientifiques*. The honorary diplomas are confined to the degree of doctor, and are conferred and delivered, without expense and without examination, by the council of administration of the university upon the unanimous proposition of the appropriate faculty, but to such persons only as have shown extraordinary merit, either by their writings, their services in the department of instruction, or in the science or profession for which the diploma is conferred. The *diplômes scientifiques* are conferred by the faculties themselves, after a public examination in the whole range of studies embraced in the prescribed course. The statutes provide that no one shall be admitted to an examination for the degree of doctor in one of the four faculties unless he has been inscribed at the university during at least one year and is already possessed of the diploma of *candidat* in the same faculty. So, likewise, the aspirant for the diploma of *candidat* in law must first have the degree of *candidat* in the faculty of philosophy and letters, and the aspirant for the degree of *candidat* in medicine the diploma of *candidat* in the sciences. Upon persons graduated by the board of examiners of the state, like degrees are conferred on the presentation and defense of a thesis to the satisfaction of the faculty. Examinations can take place at any time during the year, except during vacations, are public, both oral and written, and are conducted in either French or Latin, at the discretion of the aspirant. The subject-matters upon which examinations are made by the several faculties for the different degrees have been given already in the chapters on schools of letters, schools of science, schools of law, and schools of medicine, and need not be repeated here. They are comprehensive, and, judging from the observations I have been enabled to make during a short stay on two different occasions, also quite thorough.

When the examination of any candidate is concluded, the examiners pronounce a nicely discriminating judgment upon his qualifications;

declaring either simple admission, admission with distinction, admission with great distinction, admission with the greatest distinction, adjournment, or rejection, according to their conception of his real deserts.

Besides the degrees already named as regularly conferred by the faculties, the degree of *docteur agrégé de l'université* (with the same force as the title of *Privat-docent* conferred by the German faculties) is given by the several faculties, and, upon the recommendation of the proper faculty, may be granted by the council of administration without the usual examination; the candidate simply writing and defending a thesis. Such regular graduates as obtain diplomas marked "with great," or "with the greatest distinction," are by that circumstance made *docteurs agrégé* to the university, and, as such, may, on the recommendation of the faculty whose diploma they hold, be charged with a determinate course of study.

All diplomas granted are signed by the professors who take part in the examination, by the rector, and by the administrative inspector of the university.

Aspirants *adjourned* may, after three months, present themselves again for examination without further expense; aspirants *rejected* may try again after six months, on payment again of half the usual fees, which, for the different kinds of examinations and diplomas, range between 40 francs and 200 francs.

The present number of professors and *docteurs agrégé* in the University of Brussels is over 50. The highest salary paid is 5,500 francs, the lowest 1,000 francs. The number of students during the summer semester of 1867 was 450. Adding these figures to the foregoing, we have for the whole kingdom of Belgium, a total of 210 university teachers, and of students, 2,300, or one to every 1,950 inhabitants.

SCANDINAVIAN UNIVERSITIES.

Under this head I shall include the Danish University of Copenhagen, the Swedish universities at Lund and Upsala, and the Norwegian University of Christiania. Denmark formerly had a second university at Kiel, but that institution has, by recent absorption, become Prussian.

The University of Copenhagen, (founded in 1475,) was molded after the early German universities, and in the main has kept progress with them, although the narrow limits of the country and the comparatively large number of the people who speak the German language in preference, and hence interest themselves in German institutions and literature more than in their own, have always been a serious hinderance to its development. Its internal affairs are managed by a *senatus academicus*, or consistory, composed of a certain number of professors from the several faculties, to wit: two from the theological faculty, two from the medical faculty, three from the faculty of philosophy, two from the faculty of jurisprudence and political science, and two from the faculty of

the mathematical and natural sciences, the membership of which persons is determined by seniority, together with five additional members, chosen by the whole body of professors from their own number. The executive officer is the rector, who is chosen by the professors for the term of one year.

The whole number of professors and docents is 77; 7 belonging to the faculty of theology, 9 to the faculty of law and political science, 16 to the faculty of medicine, 22 to the faculty of philosophy, and 12 to the faculty of mathematics and natural science. Many of them are distinguished scholars, who, not only by their teaching in the university, but also by their published writings, have largely contributed to the progress of learning and science everywhere. Their salaries vary according to length of time spent in the service; beginning with 1,200 rixdollars (of 54 cents) and being increased by 200 rixdollars every three years. The highest salaries paid at present are 4,000 rixdollars.

Applicants for admission as students must bring with them a certificate of good character from their religious pastor, and from the head of the Latin or learned school where they have been students, of their having completed the course of study therein. They are then examined by the rector and received or rejected at his discretion. They pay a matriculation fee of about $5, and such as can also pay a tuition fee of $4 or $5 per semester. Students who practice in the laboratory pay a further fee of 24 rixdollars per semester. Since 1853 130 poor students have received 12 Danish dollars, with free lodgings, fuel, and 2 rixdollars per month for service in aid of their support. These stipends are tenable by each stipendiary for the period of four years, during which he lives *in commons* with others of the same class. Students not thus aided live where they choose, simply visiting the university for the lectures and practical exercises. The whole number in attendance is over 1,000.

The auxiliaries to scientific study are good, the collections in natural history, for which an extensive and beautiful building has just been completed, especially so; the cabinets and laboratories are valuable and the library, of 260,000 volumes, for which an elegant and admirably planned building has been here erected within the past five years, is one of the richest university libraries in Europe.

Besides the faculties above enumerated, there is connected with the University of Copenhagen, as I have elsewhere stated, a school of applied science *(polytechniske Læreanstalt.)* This school, as a separate polytechnicum, has been in existence for some time, but has only just lately been consolidated with the university. For a more particular account of it the reader is referred to that chapter of my report in which all institutions of this class are specially considered.

For the support of the Danish University there is a fund of some $1,860,872, and all deficiencies are made up by the government.

The universities of Sweden are also mediæval in origin. Not only so; in forming them, their founders rejected the then more recent examples

of improvement set them by the newly organized universities of Austria and Germany, and adopted the first models, going even back to Oxford and Cambridge, Paris and Bologna. And, what is more remarkable still, regardless of all the changes—the rest of the world would say progress—of the hundreds of years of their history, they have preserved, even to the present hour, almost the exact form of the mold in which they were originally cast. Indeed, they are more primitive, in some respects, than their great prototype of six hundred years ago; for they not only gather their students into *nations*, each with its own house, officers, and discipline, and compel every student entering to join one of them, but they have always paid, and still continue to pay, their professors' salaries partly in corn, wood, and such other articles of home consumption as are produced upon the university estates.

They are both state institutions, governed by the same royal statutes, and managed in precisely the same way, through chancellors, pro-chancellors, and consistories, very much after the manner of Oxford and Cambridge.

The King is the primal source of the organizing power, and but little is done without his consent. In the first place, he appoints the chancellor and all the professors, secretaries, &c. These last all together constitute the *consistorium academicun majus*, whose prerogative it is to nominate the pro-chancellor and the rector to the King and chancellor respectively, by whom the appointments are made. The consent of the consistory is also necessary to any arrangements for the internal management of the institution that may be proposed by the pro-chancellor or chancellor. The chancellor is some nobleman in high position, and the pro-chancellor is either an archbishop or the bishop of the diocese in which the university is located.

The immediate supervision of the university is intrusted to the rector, who can neither be nominated by the consistory nor confirmed by the chancellor until after he has been a professor for at least two years; as in Germany and several other countries, his term of office is only one year. The law makes him directly subject to the pro-chancellor, so that he cannot even be absent from the institution more than eight days without his consent.

The faculties of the Swedish universities are the same in number and title as in Germany, and the head of each is also a dean (*Decanus*) of its election. The teachers (*Lärare*) are professors, adjuncts, and docents.

The students gain admission through certificates of moral character and proficiency in study, and through examinations by the rector. The matriculation fee is about $5 70; fee for private lectures, $1 50 to $3 per semester. All public lectures are free. As soon as matriculated, all are required by law to unite with some one of the *nations*. In former times—from 1750 to 1852—the university authorities had complete jurisdiction over all classes of offense by students and other members of the university and their families, whether against the discipline of the institution or against the laws of the land, within a circuit of one mile; but

by royal edict of the year last named such jurisdiction was limited to cases of discipline merely.

Each *national* organization comprises one inspector, who is always a professor; seven to nine honorary leaders, who are professors, doctors of theology, philosophy, &c., bishops, military officers, and other officials; one curator, who is either an adjunct professor or *Docent;* and members, classified as seniors, (of whom there are two to four,) juniors, (including the great body of the *nation,*) and novitiates, or new-comers. Thus constituted, the *nation* is a sort of independent state, with its own constitution, laws, and regulations, and amenable only to the royal statutory provisions governing the university itself. Sometimes several nations are embraced under one national title, as the *Skänska Nationen,* and others at Lund, in which case they are subject to one common "inspector" and one set of "honorary leaders;" but each division has, in other respects, the full national organization.

The University of Upsala, founded 1476, is the more famous of the two; its greater distinction being largely due to the attention of the world having been drawn to it at an early day by men of unusual attainments, and during the first half of the last century by the great Linnæus, who there studied and afterward taught, and who, by contributions never surpassed in value by those of any naturalist, fastened upon Upsala the admiring eyes of all men of science throughout the world. It has, accordingly, been always liberally dealt with by the government and largely attended. The present number of professors and adjunct professors is 55; 4 professors and 4 adjuncts belonging to the faculty of theology, 4 professors and 2 adjuncts to the faculty of law, 5 professors and 5 adjuncts to the faculty of medicine, and 17 professors and 14 adjuncts to the philosophical faculty. The number of students is, of late years, about 1,500. The library of the university contains over 100,000 volumes, and the numerous scientific establishments, including an astronomical observatory and various laboratories, cabinets, &c., are quite extensive. The botanical garden owes much to Linnæus, and is still one of the first that I have seen in Northern Europe.

The University of Lund, founded 1479, is also provided with the various aids to literary and scientific study; the library, of nearly 100,000 volumes and several thousand manuscripts, being especially rich in works of antiquity, and the natural history collections, especially the collection of birds, among the best in European universities. The number of teachers is 65, distributed as follows: 4 professors and 3 adjuncts in the faculty of theology; 4 professors and 1 adjunct in the faculty of law; 5 professors and 2 adjuncts in the faculty of medicine; 16 regular professors, 3 professors *emeriti,* 13 adjuncts, and 12 *docents* in the faculty of philosophy. The number of students is, at present, 400, all of whom are embraced in seven *national* groups, known as Götiska, Smälands, Skänska, (embracing seven divisions, each with its own curator, seniors, and juniors,) Blekingska, Göleborgs, Kalmare, and Wermlands *Nationen.*

While their ancient form is preserved, it is, nevertheless, perceivable that in spirit the old universities of Sweden are coming of late years more into harmony with the progressive spirit of the present age; and it is more than probable that the now steady growth in them of what they call the *new* sciences will break the mediæval shell ere long and give to them a freer and more perfect development.

The only university in Norway is the University of Christiania, founded in 1811. Belonging wholly to the new era in university history, and organized soon after the founding of the great University of Berlin, it wisely discarded the old models of the Middle Age and adopted an essentially German plan. It possesses the four faculties of theology, law, medicine, and philosophy, and has 34 professors, and between 700 and 800 students. Pupils are admitted from the Latin schools of the country after an examination in Latin, German, French, the natural and physical sciences, arithmetic, and geometry, and the payment of a matriculation fee of about $6. They are then known as *students* and *citizens* of the university, and are free to attend on all the public lectures without payment of tuition or other fees, except in the laboratories, where they are required to pay the cost of material consumed by them. The first and lowest degree conferred is that of *candidat;* the examination for which, though free to all students, is of such grade as usually to require about two years of diligent study. Some accomplish the work necessary to promotion in a less time, and many students, by reason of partial occupation as teachers in the country schools and otherwise, employ a much longer time in fitting themselves for the *Candidats-Examen.* The titles of master and of doctor in the faculty of philosophy are only occasionally conferred or sought; many learned men and even professors never making application for higher honors, the title of doctor not being essential to the practice of a profession, the faculties of law, theology, and medicine only occasionally are called upon to confer it upon other than such as aspire to some public office for which the rank of *candidat* is not sufficient. The scope and character of the examinations for the professional doctorates are such that a continued study, after candidacy, of about three or four years in the faculties of theology and law, and of five or six years in the faculty of medicine, is found necessary.

The government has enabled this university to gather about it a library of over 120,000 volumes, and numerous natural history and antiquarian collections, and to create a well equipped astronomical observatory and other scientific establishments of considerable extent and value.

As compared with the German ideal, or even with its actual, none of the several Scandinavian and other universities of the northern countries are as yet fully worthy of the proud title they bear. But I think I have shown that they have all entered the way of progress and are destined to attain to that higher standard at a not far distant day.

RUSSIAN UNIVERSITIES.

Naturally enough, Russia was the last of the European nations to establish universities. Nor even yet has she made great progress in that direction, the present number of such institutions in the whole empire being but seven, with a total of students scarcely exceeding 5,000, or one to every 14,000 inhabitants. The first university established by the Russian government was that of Moscow, founded in 1755; for, though the University of Dorpat dates back to 1632, it was not of Russian origin, having been founded by Gustavus Adolphus, of Sweden, eighty-nine years before the province of Livonia became, by the treaty of Nystadt, a part of the Russian Empire, (whereupon, instead of being developed and strengthened, it was actually suppressed and not again restored until the opening of the reign of Nicholas in 1802;) while the Finnish University, long at Abo, where it was founded in 1640, but now located at Helsingfors, was also of Swedish origin. The other four, to wit, those of Kasan, founded 1803, Kharkov, 1803, St. Petersburg, 1819, and Kiev, 1833, are of quite recent origin.

The general features of the Russian universities are essentially German, and much of the instruction in them is given by German professors. With two exceptions, however, they are without theological faculties; and the German faculty of philosophy, which embraces all general studies outside of the professional faculties, is, in most cases, divided into two distinct faculties—the historico-philological and the physico-mathematical, and sometimes three oriental languages being the third. The instructors are ordinary and extraordinary professors and private docents, though bearing different names, and in some unimportant respects sustaining slightly different relations. They are generally paid rather higher salaries than in the German and Scandinavian States, 2,666 rubles, ($2,009,) though considered a high salary, not being very uncommon. The fees demanded of students are, in all cases, very moderate, much the larger part of the cost of maintenance being supplied by the government.

The most numerously attended and munificently supported of the Russian universities is that of Moscow, whose faculties are represented by a total of 120 professors and other teachers, including many men of much learning and great distinction, and the students in attendance upon which have sometimes numbered over 1,700. It is well provided with the usual facilities in the way of libraries, collections, &c., and is exerting a powerful influence upon the intellectual culture of the empire.

The University of St Petersburg ranks next in importance. Though more than once it has suffered from the caprice and arbitrary power of a former sovereign, it is now, under the fostering care of the present Emperor, in a pretty good condition. It occupies plain but extensive and commodious buildings on the Neva, and at Neoska, near by, where the medical faculty is located, that its large number of medical students

may have convenient access to the great hospitals in that portion of the city. Besides the four faculties common to the Russian universities, it includes also a school of oriental languages. The instruction is given by 74 professors and teachers, of whom 15 belong to the historico-philological faculty, 28 to the physico-mathematical faculty, 12 to the juridical faculty, and 19 to the faculty of medicine and surgery. During the summer semester of 1867 there were 694 students in attendance—the total for the year is sometimes 1,200—distributed by faculties as follows: in the faculty of history and philology, 56; in the law faculty, 23; in the faculty of physical and mathematical sciences, 138; in the faculty of medicine and surgery, 477.

The ordinary professors receive a salary of 3,000 rubles, (of 75 cents;) extraordinary professors, 2,000 rubles; docents, about 1,200. Students pay 50 rubles per annum.

The scientific establishments belonging to the university, including laboratories, museums, and collections, are only fair in extent and quality, and the library contains 80,000 volumes.

The amount received from the state for the support of the institution, as given me by the secretary, is 280,000 rubles per annum, including 50,000 rubles given in aid of poor students.

Kasan is distinguished by its division or school of Asiatic languages, said to be more extensive and complete than that of any other university in the world. Number of university professors and docents, 76; of students, about 400.

The universities of Kharkov and Kiev, both founded by Alexander I in 1803, and since provided with many important scientific auxiliaries, besides valuable libraries, are liberally sustained by government and people; the first-named having 80 instructors and 500 students, the last 100 professors and other teachers, and about 1,000 students.

Dorpat possesses a theological faculty next in rank and importance to the great theological institute at Moscow, but is more particularly noted for the world-wide honors won by its physico-mathematical faculty, or rather, by its astronomical observatory, first made famous by Tycho Brahe, and since well maintained in its high rank by Struve and other eminent astronomers. Its library comprises 75,000 volumes, and it numbers about 90 teachers and 600 students.

The University of Finland, at Helsingfors, although now embraced within a grand-duchy of the Russian Empire, and not only established where it now is, but also supported by the Russian government, is, nevertheless, to all intents a *Finnish* institution; on which account—because Finland is usually thought of, and had been previously thought of by myself, as a polar country, quite beyond the reach of educational instrumentalities, and certainly of superior institutions of learning—as well as on account of its really very respectable character and prosperous condition, my inspection of its several departments was fruitful of more surprise and pleasure than were afforded me by almost any other university of Northern Europe.

The destruction of its ancient buildings and library, in 1827, at Abo, where it was formerly located, necessarily rendered its re-establishment at Helsingfors, the new capital, the equivalent, in all material respects, of a new creation. Still, in organization it has preserved the mixed German and English element, as first adopted by its Swedish founder, being governed by a chancellor, (which office is filled by the Emperor Alexander himself,) an immediate representative of the Emperor, *tjeust förrattande Kansler;* the incumbent *ex officio* being the imperial minister and secretary of state for Finland,) a vice-chancellor, a rector, and pro-rector, and a consistory composed of the rector and twelve professors. The faculties are theological, juridical, medical, and philosophical; theology being taught by 4 professors, law by 5, medicine by 6 professors, with a prosector and 2 docents; and philosophy by 18 ordinary professors, 1 extraordinary professor, 6 readers, and 14 docents; besides which, there are 5 masters of exercise, *(Exercitie-Mästare,)* such as music, drawing, gymnastics, &c.; the total number of teachers thus being 61.

As in all the universities of the far north, the instructional force in the several professional faculties is small; but it will be observed that—what is of really more importance, as showing the presence, in this hyperborean land, of that *wissenschaftlichen Geist* of which Germany is the great nursery, and without which no nation may hope for the highest intellectual development—the faculty of philosophy, with its corps of 39 learned teachers, has a truly German look, and furnishes the most gratifying evidence of at least a learned class among the Finns. This evidence is corroborated, moreover, by the existence of as fine an array of libraries, museums, cabinets, laboratories, and the like, as is usually found in the more famous universities of Middle Europe. Notwithstanding the destruction of its former library of 40,000 volumes at Abo, in 1827, as above mentioned, its present accumulations amount to over 100,000 volumes, representing every department of literature; while among its scientific establishments and collections there are: a large and handsome and well-equipped astronomical observatory; a magnetic observatory; a cabinet of physical instruments; new and excellent chemical and pharmaceutical laboratories; valuable collections in natural history, including a most interesting display of Finnish birds and minerals; a botanical garden; a museum of coins, medals, and works of art; an ethnographical museum; a musical oratorium; a physical gymnasium; a riding-school, &c. The university has, also, connected with it a printing and book-publishing establishment, from which are issued many valuable works in the Finnish, Russian, and Swedish languages, and a general pharmaceutical and apothecary establishment, the last named being under the management of the medical faculty. Nor does this enumeration complete the report of what this vigorous and progressive university is doing to advance the interests of science and learning in Finland. Its scope has just been enlarged by the incor-

poration with it of a polytechnic department, as already stated under another head, that promises at an early day to rank among the best schools of science and the arts in Northern Europe. The magnificent new building—between 200 and 300 feet long, and three stories high—was nearly completed when I saw it, (June, 1867,) and, ere this, the polytechnicum must have been organized and put in successful operation.

The interest felt in this university by the government is further manifested by the annual appropriation of 450,000 marks (of 20 cents each, or $90,000) in aid of its support. In consequence of this generous encouragement, it is enabled to pay the professors very fair salaries—6,000 to 10,000 marks—with but moderate fees from students, of whom the number in attendance is 474, viz: 51 in the theological faculty, 128 in the law faculty, 28 in the faculty of medicine, 147 in the historico-philological section of the philosophical faculty, and 120 in the physico-mathematical section.

The term of study in each of the faculties is four years, and the degrees conferred are those of candidate, (as in Belgium,) master, and doctor.

UNIVERSITY EDUCATION IN AMERICA.

It has been said, both at home and abroad, that there are no real universities in America. And if we allow that the German ideal, which is unquestionably the highest at present recognized by any considerable portion of the educational world, be the true one, then it must be acknowledged that this somewhat humiliating statement is true; nay more, that it falls quite short of the whole truth, a full expression of which would be that there is really nowhere, whether in the New or in the Old World, a real university outside of Germany. For, so far as the so-called universities of all other countries are concerned, it will appear from the foregoing review, either that they are something quite different, as is the case with those of England, for example, or that, being patterned after the universities of Germany as a model, they fall far below them in the most important particulars; while, of those of America it may be truthfully affirmed that they are both different and inferior—different, I mean, from the best German models, and also, with two or three exceptions, inferior to the English models after which our institutions of the superior class are chiefly fashioned.

In South America there are at present no institutions bearing the name of university, nor is there one now known by any other name to which the title of university could be properly applied. At Santiago, in Chili, there is a "National Institute," embracing a high school department, together with faculties of law and medicine, but it is now in no sense a university, nor does it seem to be the fixed purpose of the government to give it a university development. And in Brazil, which, educationally, is the farthest advanced of the South American States, as I have had occasion

to show in preceding chapters, although there is a fully formed project to establish a great national university like those of Berlin and Vienna, but little has yet been accomplished. I know of no other South American State that deserves special mention in this connection.

The Canadian universities are all of the British type, and naturally as inferior in rank and importance as they are in wealth and years to those of the mother country. The most important institutions are the Laval University at Quebec, with faculties of arts, law, and medicine, and a theological school, none of which are either properly supplied with professors, or numerously attended by students, however—and the University at Toronto. The last-named has an endowment of 225,000 acres of the public lands, with an unusual array of fine buildings, erected at an aggregate cost of over $300,000, and promises, at a day not far distant, to become a university in fact as well as in name. It embraces in its plan faculties of arts, medicine, and law, together with schools of engineering and of agriculture. There are, besides these nominal universities, several colleges in both Upper and Lower Canada possessing university powers, but yet being in no sense universities. The degrees conferred by the Canadian institutions are essentially English, although the more "scientific" tendencies now characterizing the institutions of the United States are beginning to manifest themselves.

In the United States the condition of university education is not very materially different. The number of institutions bearing the title of university is much larger than in any other country, and a less number of them have really any sort of claim to it. But, on the other hand, there are a few institutions—three or four of them originally established as colleges, and still modestly preserving that title, and an equal or less number more recently chartered as universities—the number of whose faculties, the high quality of whose aims, and the distinguished character of whose officers and professors entitle them to respectful consideration in this general survey.

HARVARD COLLEGE.

Pre-eminent among the colleges possessed of university characteristics are Harvard College, at Cambridge, Massachusetts; Yale College, at New Haven, Connecticut; and Columbia College, at New York. The first named dates back to 1636, and is the oldest institution of learning in America. From the small beginning then made with the object of preparing young men for the work of preaching and of teaching in the public schools, it has slowly developed by the formation of professional schools and the expansion of its academic department, until it now presents at least the semblance of what the Germans understand by a *full* university, the number of whose faculties, it will be remembered, must not be less than four, including those of theology, law, and medicine, embracing as it does:

1. An academical department, including regular courses in religion,

philosophy, rhetoric and oratory, history, modern languages, Latin, Greek, Hebrew, natural history, anatomy and physiology, chemistry and mineralogy, physics and mathematics, with 28 professors and instructors, and about 500 students.

2. A divinity school, (liberal,) with 3 professors and 19 students.

3. A law school, with 3 professors and 138 students.

4. A medical school, with 11 professors and assistants and 308 students.

5. The Lawrence Scientific School and School of Mining and Practical Geology, with 7 professors, most of whom also give instruction in the academical department, and 41 students.

6. A special school of astronomy, with 2 professors and 3 students.

7. A museum of comparative zoology, with special lectures by 4 professors; and

8. A dental school, with 7 professors, some of whom are also members of the medical faculty.

A further addition to this array of distinct schools is about to be made, if, indeed, it has not already been concluded, by the connection with the college of an "Episcopal Theological School," the management of which is to be practically with the Protestant Episcopal Church, but whose professors and pupils are to have access to the libraries, museums, and lectures of the college. And there has, of late, been organized a series of courses of lectures on various subjects, open to all graduates of colleges, to public school teachers, to persons connected with the college, except undergraduates, and to others on the payment of a certain fee. These courses are collectively known as "university lectures," and it is the design that they shall eventually constitute a high faculty of philosophy.

The material auxiliaries consist of general and special libraries, comprising about 150,000 volumes; chemical and physical laboratories; the museum of comparative zoology, destined, under the administration of its distinguished director, Professor Louis Agassiz, to become one of the most extensive and important collections in the world; valuable mineralogical and botanical collections, and a well furnished astronomical observatory.

The external administration of Harvard College is vested in two separate boards; the first, known as "the corporation," and consisting of the president, five fellows, and the treasurer, with power to supply all vacancies in its own body, as well as to nominate professors and other instructors, subordinate officers, &c.; the second, a board of "overseers," composed of the president and treasurer, *ex officio*, and thirty members, chosen by the legislature after a method that requires the dropping out of five members and the election of their successors annually, and clothed with general administrative powers, some of which are exercised independently, and others in conjunction with the corporation.

The endowment of the college consists of such funds and other property, personal and real, as have been bequeathed to it by numerous individuals, societies, and corporations during the past two hundred and thirty-

two years; the present total valuation, independent of the college grounds, buildings, libraries, and collections, being something over $2,000,000. The total income from all sources, including tuition fees, the past year, was about $180,000, full half of which, however, has to be credited to funds which are not available for general purposes, owing to the special direction given to them by the donors.

If now we turn our attention to the condition of the institution, educationally, we shall find the academical department doing the general work of the German gymnasium. In the mathematics, as well as in the physical and natural sciences, it accomplishes a little more; but, on the other hand, in the ancient and modern languages the course of study is quite inferior, so that the most proficient bachelor of arts leaving Harvard would hardly be prepared to enter any of the great universities of Europe. It is, in fact, nothing but a preparatory school as compared with a proper faculty of philosophy. It is supplemented in a certain way, it is true, by the Lawrence Scientific School; but this supplementation is more in appearance than in reality, since the school in question has no essential connection with the department, to which it stands rather in the relation of a scientific rival, offering several brief, independent, and, for the most part, professional courses of instruction to the most meagerly qualified students, and sending them out with titles in no way expressive of their real attainments. In speaking thus I must not be understood as disparaging either the praiseworthy aims of the noble founders of this scientific school, the indisputably high character of the distinguished men who give the instruction, or the useful office fulfilled by institutions of this class, but rather as making an impartial comparison of it with the highest existing standards. A school of science, with departments of chemistry, of zoology and geology, of engineering, of botany, of comparative anatomy and physiology, of mathematics, and of mineralogy, each in charge of the very ablest professors, and furnished with excellent means of illustration and experiment, could hardly fail of accomplishing great good, even though, as in the Lawrence School, the qualifications for admission should simply be a good moral character, and "a good common English education," and the term of study "at least one year." But that is not the question. The point not to be overlooked is this, namely: That the foremost of our American universities presents nothing in the way of a general foundation for professional studies at all comparable with the philosophical faculty of the European university.

The professional schools present a picture scarcely more encouraging; for although they rank higher in some respects than many others of their class in this country, and are conducted by men of great ability and distinction, they are, nevertheless, sadly deficient in the number of their professors; their libraries are deficient; their standards of admission, as to preparatory education, are exceedingly low; the periods of study are quite too short; and the charges for tuition so high ($75 to $200 per annum) as practically to exclude many worthy young men who ought to

be able to, and who otherwise would, attend. This last objection is met, to some extent, especially in the divinity school, by bursaries in small number. The term of study in the law school is two years; in the divinity school, three; and candidates for the degree of doctor of medicine must have studied three years with a preceptor and attended two courses of lectures.

YALE COLLEGE.

Yale College, though sixty-four years later in getting established, had a similar origin and has had a like career. It embraces—

1. An academical department, with 17 professors and 519 students.
2. A department of philosophy and the arts, with 22 professors, (several of them also engaged in the first-named department,) and 140 students.
3. A school of the fine arts, (not yet fully organized, but assuming form.)
4. A theological department, with 8 professors and 25 students.
5. A law department, with 2 professors and 17 students.
6. A medical department, with 9 professors and 23 students.

The college possesses libraries, with a total of 81,000 volumes, valuable collections in geology, mineralogy, botany, and zoology, excellent chemical laboratories, an observatory, &c.

The total amount of funds at present available for the support of the college in all its departments is something over $1,000,000. Of this sum, $291,446 is a general fund, the income of which may be used for any collegiate purpose; and the remainder, including $135,000 derived from the sale of agricultural college scrip, consists of special funds designed by the donors for the support of particular departments, professorships, scholarships, &c. Besides which, there are "accumulating funds" to the amount of $181,703, the income of which is, for a time, to be added to the principal, and recent donations for building purposes to the amount of $140,360.

As an institution of learning, Yale differs from Harvard chiefly in the constitution of its department of philosophy and the arts. This department was formally instituted in 1847, with the view of providing advanced courses of study for graduates and others, whose requirements were not already met in the then existing professional schools. The aim was in fact a philosophical faculty analogous to those in the German universities, and for a time this idea was kept prominent; but since the date of its organization, the demand for instruction in the applications of the material sciences to the useful arts has been so great that the organization of a distinct scientific school, though still subordinate to the department, became necessary; since which date the more literary side has practically had less relative importance. At present this school of science, known as the Sheffield Scientific School, embraces seven distinct courses of study, to wit: 1, chemistry and mineralogy; 2, civil engineer-

ing; 3, mechanical engineering; 4, mining and metallurgy; 5, agriculture; 6, natural history and geology; 7, select course in science and literature.

Candidates for admission must be not less than sixteen years of age and undergo a twofold examination: 1st, in mathematical studies, including arithmetic, algebra, geometry, and plane trigonometry; 2d, in the elementary literary studies, including English grammar, history of the United States, geography, Latin grammar, and in the first six books of Virgil or some equivalent author. The charge for tuition is $125 a year, and special students of chemistry are required to pay $75 extra for chemicals and use of apparatus.

The term of study in each of the courses is three years; the studies of the first year being introductory in their character and common to all. The degree conferred on the student who satisfactorily completes any one of these courses is that of bachelor of philosophy. The degree of civil engineer is also conferred on students of a higher course in engineering (occupying one year) who have sustained the final examination and given evidence of their ability to design important constructions and make the necessary drawings and calculations. The second section of the department of philosophy and the arts provides advanced courses in: 1st, philosophy and history, including political philosophy and international law; psychology, logic and history of philosophy; history and criticism of English literature and history; 2d, philology, embracing Latin and Greek languages and literatures; general philology, ethnology, and oriental languages, and modern European languages; and, 3d, mathematics, including pure and mixed mathematics and astronomy.

Candidates for admission must either present the diploma of bachelor, (of arts, science, or philosophy,) or pass an examination in studies properly preparatory, equivalent to that required for admission to the Scientific School. The term of study requisite to a final examination for the degree of bachelor of philosophy is two years. The degree of doctor of philosophy is also conferred on such persons as, having already obtained the degree of bachelor, continue a course of higher studies under the direction of the faculty for the further period of two full academic years, and pass a satisfactory final examination, and present and defend an acceptable thesis. It is also required that, in case the bachelor's degree possessed by the candidate for the doctorate should be such as not necessarily to imply a knowledge of Latin and Greek, he shall pass a satisfactory examination in these languages, "or in such other studies, not included in their advanced course, as shall be accepted as an equivalent by the faculty." The price of tuition in this section is about $100 per annum.

As to the professional departments of Yale College, it is worthy of remark, that the degree of bachelor of divinity is conferred only upon bachelors of arts who have satisfactorily completed a three-years' course of theological study; that the degree of bachelor of laws is conferred on

"liberally educated" students after eighteen months' study in the law department, and to students not liberally educated, after two years of study, no preparatory study or preliminary examination being requisite to admission in any case; and that two to three years of study, including two courses of medical lectures, are the conditions of admission to the degree of doctor of medicine.

The totals of the charges for tuition and the diploma in each of the professional faculties are as follows: In the divinity school, no charge is made for instruction; room rent is also free; and the only charge is $5 per annum for incidentals. Total of fees in the medical school for the two courses and diploma, $240; in the law school, $155.

COLUMBIA COLLEGE.

Columbia College was chartered in 1754, from which time until 1784 it was known as King's College, afterward as a university until 1787; at which date the name was changed to the present. Quite early in its history it was the recipient of numerous donations of land and money, which, together with those subsequently made, have reached an aggregate value of but little less than $2,000,000. It has been the desire of the board of trustees to give it a university character by the gradual development of a faculty of philosophy above the academical department, and the incorporation of such professional faculties of a high order as should seem to be most urgently demanded by the country and times. At present, however, it embraces only the following:

1. A school of letters and science, with a four-years' course of study equivalent to the ordinary college course of the country, a faculty of 12 professors and other instructors, and an average attendance of 150 students.

2. A school of mines, with a three-years' course of instruction, given by 14 professors and assistants, (three of whom are also members of the faculty of arts,) and attended by about 100 students.

3. A school of law, with a two-years' course of study, a corps of 4 regular professors, and 4 special lecturers, and an average of 180 students; and,

4. A school of medicine, (the College of Physicians and Surgeons of the City of New York, with which, however, the present connection is maintained only during the pleasure of the respective boards of trustees of the two colleges,) in which the instruction is given by 12 professors, aided by 7 assistants, and upon which there is an attendance of nearly 500 students.

The charges for tuition in the several departments are as follows: In the academical department, $100 per annum; in the school of mines, $160; in the law school, $100; in the school of medicine, about $100 for each term of lectures. Several societies and municipal corporations are entitled to from two to four free scholarships; every religious denomination in the city of New York is entitled always to have one student,

who may be designed for the ministry, in the college free of all charges for tuition; and finally, every school from which there shall be admitted four matriculants in any year is allowed to send one pupil free of charge.

OTHER UNIVERSITY ORGANIZATIONS IN THE UNITED STATES.

Of organizations in the United States styling themselves universities, there are nearly one hundred. They are of three general classes, to wit:

1. Denominational universities, founded and managed by religious sects.

2. Non-sectarian universities, which, though in the main independent, are partly endowed and controlled by the State; and,

3. Universities originally founded and wholly controlled by the State.

The number of the universities of the first class is already some threescore, and every year others of new creation are added to the list. A few of them have long, and very justly, held an honorable rank among the collegiate institutions of the country; but not one of them has, as yet, established any sort of claim to the title of university, while, of the large majority, one finds it somewhat difficult to make mention in such a connection in other terms than those of reprobation and contempt.

Universities of the second class named find notable illustrations in Kentucky University, and in Cornell University; each of which owes its existence and its magnificent beginnings of endowment to the labors and princely liberality of a single citizen.

Kentucky University, lately removed from Harrodsburg to Ashland, in the vicinity of Lexington, and through the efforts of Mr. John B. Bowman, its originator and present practical head, greatly enlarged by the consolidation therewith of Transylvania University, and the new College of Agriculture and the Mechanic Arts, endowed by the act of Congress of July 2, 1862, by liberal appropriations from the State treasury, and by donations from individual citizens to the amount of nearly a quarter of a million dollars, may properly date from 1865. And yet, thus soon, it embraces four departments in vigorous operation, namely: an academical department, a college of arts, a law faculty, and a school of divinity, with a total of twenty-five professors and other teachers, and a large number of students. The plan also includes an agricultural and mechanical college, a normal college, and a college of medicine; for the early opening of all of which measures are in progress. The government is vested in a board of curators, consisting of not less than thirty of the donors, and is practically exercised by the executive, who is styled "regent," and a small executive committee. The College of Agriculture is subject to visitation from a board of six visitors, appointed by the governor with the advice and consent of the senate.

Cornell University, located at Ithaca, New York, very properly bears the name of its munificent originator, Mr. Ezra Cornell, whose constantly augmenting donations already amount to nearly or quite $1,000,000, and

through whose personal efforts it secured the 990,000 acres of land granted to the State by Congress for the endowment of a college of agriculture and the mechanic arts. The plan of the institution, as presented in the organic act, is a broad and liberal one, with a very special recognition of the claims of the industrial arts. Distinguished scholars, some of them long and honorably connected with European universities, are being secured for important professorships, and no means are to be spared necessary to make it an institution worthy of the State and of the country.

Universities of the third general class are divisible into three special classes. Of the first there is but one example, the University of the State of New York. This anomalous organization was created during the administration of Governor George Clinton, in 1787. It has no visible existence other than in a board of regents clothed with certain supervisory powers, suggestive of the old University of France and the more modern University of London—the only others of either the past or present time to which it bears much resemblance. And yet it is quite different from both of these, for the University of France was a council of management, holding absolute power over every class of schools of the empire; and the University of London is barely an authorized board of examiners, determining the qualifications of such aspirants for literary honors as may come to it for sanction, whether from private study or from the many institutions whose pupils look to it for their degrees; while the University of the State of New York confers none but honorary degrees, and is limited in its supervision to certain colleges and academies—over two hundred in number—to which it apportions the annual income of "the literature fund," and from whose officers it is authorized to require annual reports, itself, in turn, reporting its own transactions to the legislature.

A second division may embrace universities whose declared purpose it is to become, not representatives of universal culture and knowledge, but of the sum total of knowledge of a particular class, directed to special ends. Of institutions of this sort, *i. e.*, organized for partial purposes, and yet styling themselves universities, we have but two examples—the Industrial University of Illinois, just organized, and the Normal University of Illinois. The first of these is, in fact, a polytechnic school with an academic department, in which there is a leaning to the scientific rather than to the classic side—in other words, a college of agriculture and the mechanic arts of the peculiar character outlined in the congressional act of 1862, already referred to. It is endowed with over $400,000 in lands, buildings, and bonds, chiefly donated by the citizens of Champaigne County, where located, besides 480,000 acres of public lands from the congressional grant. The Normal University, located at Normal, is neither more nor less than a high normal school, and has no better claim to the title of university than Bologna had when it was simply a school of law.

In the third division of our State universities I include all institutions incorporated as such, without limitation, by title, to any partial field of learning, and which, unlike the University of New York, are designed to furnish within themselves the means of the higher culture. The oldest of these—the University of North Carolina—dates back to 1789; the South Carolina University, to 1801; the Ohio University, to 1804; and the University of Virginia, founded through the instrumentality of Thomas Jefferson, and molded by his hand, to 1819; but the larger number are of quite recent origin, and for the most part belong to the Mississippi Valley. Those of Indiana, Alabama, Michigan, Missouri, Wisconsin, Mississippi, and Iowa, (naming them in the order of foundation,) have been in actual operation for some years; but others, including those of Minnesota, Kansas, and California, are only just now taking form; while yet others, to be established in the newest States, under the stimulus of that wise and liberal policy of the national government which sets apart a portion of the public domain for this purpose in all the incoming States, have, as yet, only a nominal existence.

The older institutions of this division were generally fashioned after the English models; while the more recent ones are undergoing such changes, by the incorporation of the new schools of science, and of the industrial and the fine arts, as will distinguish them from such, and, indeed, from most other foreign models. All are governed by trustees or regents of state appointment, (executive in some and legislative in others,) and the administrative head is known as chancellor, rector, or president. Being strictly state institutions, and there being in this country no state church, they are constitutionally free from denominational control, and the charter of one of them (the university of the State of Missouri) even prohibits the appointment of a clergyman to the office of president or professor. Several provide for free scholarships in considerable number, and the design is that in nearly, if not all, tuition shall be ultimately free.

At the present moment some of them consist merely of the ordinary school of literature, science, and the arts, and others also embrace one or more professional schools, which, however, I am sorry to say, are, in general, of a rather inferior grade.

At the head of this new cluster of incipient universities, and prominent also among the foremost superior institutions of the whole country, stands the University of Michigan, organized in 1837. By a careful management of the congressional grant of lands, seconded and encouraged by State and municipal liberality, the endowment of this institution has been made to yield an income of nearly $60,000.

The departments already in operation are three: 1. The department of science, literature, and the arts. 2. The department of medicine and surgery; and, 3. The department of law.

The first-named department is devoted to general instruction and discipline, and the studies prescribed are so arranged as to constitute a four

years' classical course, corresponding to the undergraduate course in the best American colleges; a four years' scientific course, in which more attention is given to the English, French, and German languages and literatures, and to the mathematical, physical, and natural sciences, and from which the classics are omitted; a four years' course in civil engineering, in part identical with the general scientific course, but concluding with professional studies; and, finally, shorter courses in mining, engineering, and in analytical chemistry. Excellent working chemical laboratories are in operation. Valuable collections in natural history and in the fine arts have already been formed, and the astronomical observatory is fast becoming one of the most distinguished in the country.

The degrees conferred in this general department are those of bachelor of science, bachelor of arts, civil engineer, and mining engineer. The degrees of master of arts and master of science are conferred upon bachelors who devote one year's additional study to appropriate branches chosen from programmes designated by the faculty, as well as upon graduates of three years' standing who have engaged during that period in professional, literary, or scientific studies.

The instruction in this department is given by the president and 18 professors, and the number of students ranges between 350 and 500.

The department of law is well organized, in accordance with the American idea of legal education, and is more largely patronized than any other law school in the United States. No particular educational qualifications are requisite for admission. The course of study is continued through a period of two years, with one term in each year, commencing on the 1st of October and ending with the last week of March; the number of lectures and examinations being ten each week. The instruction is given by four professors, judges of the supreme court of the State, and the attendance is nearly 400.

The medical department of the University of Michigan possesses more than ordinary interest on account of its higher standard of admission than is common in this country, and because of the illustration it affords of the practicability of sustaining a great and flourishing medical school in a country town of but moderate population. The conditions of admission are: "a good moral and intellectual character; a good English education, including a proper knowledge of the English language and a respectable acquaintance with its literature and with the art of composition; a fair knowledge of the natural sciences, and at least of the more elementary mathematics, including the chief elements of algebra and geometry, and such a knowledge of the Latin language as will enable the candidate to read current prescriptions and appreciate the technical language of the natural sciences and of medicine." The degree of doctor of medicine is conferred upon the usual conditions. The number of professors is 11; of students, between 400 and 500.

Tuition in all the departments of the university, general and professional, is *free;* the only charges made being a matriculation fee of $10,

(of $20 for students from without the State,) and $5 per student for incidental expenses.

Michigan has certainly made a noble beginning and one worthy the emulation of the other States upon which like endowments have been conferred. But it is only a beginning after all. Students cannot make a great university, though they throng the halls of an institution by thousands. It is rather by its multitude of learned professors covering the whole field of human knowledge and furnished with every needed material aid to the instruction they offer, that the university is to be known. And these only can be had where there is that appreciation of their necessity that leads to resolute and irrepressible effort to secure them. More income is still the crying need of Harvard, Yale, Columbia, and Michigan. And if this be true of these, the foremost of our superior institutions, what shall be said of that swarm of petty academies that wear the title and do the honors of the university in scores of our country villages, with from three to ten professors each, and endowments varying from $20,000 to $100,000 all told?

In view of this poverty of even the best endowed of our American universities, we may make the most generous concessions of high purposes and practical wisdom to those who direct them, and yet find ample reasons for their actually low educational condition in every department. They who are responsible for their management doubtless lament this low condition, but it is none the less impossible for them to make seventy to one hundred thousand dollars at Cambridge, New Haven, New York, or Ann Arbor, do the work of three times that amount at Vienna or Berlin. When, therefore, we confess that the academical department of the oldest and the most advanced of our American universities is entitled to rank scarcely higher than the German gymnasium, whose certificate is essential to admission to the central and foundation faculty of the German university; that the average graduate, fresh from some of our most noted scientific schools, could hardly pass the entrance examination at any of the European polytechnicums; and that the terms of admission to all our university professional schools, and the meagerness of the courses of study prescribed, as requisite to the degrees they confer, are justly a reproach to the intelligence of our people and a laughing-stock with those who understand them in the Old World, it should be with feelings of profound sympathy for the many self-sacrificing scholars of America who are struggling to insure to their respective institutions, and to American superior education, a more honorable career. The reproach is chiefly with the governments and the people who refuse the necessary means.

And yet, after all, the question will sometimes arise and even repeat itself—and occasionally with a little impatience—whether the cause of the higher culture and the interests of education generally would not be better promoted by raising the standards of admission and graduation quite above the present low level; thus putting all truly preparatory

work upon the high schools, academies, and colleges, where it properly belongs, and employing the whole instructional force of the university in attempts to meet that growing demand for instruction in the higher departments of learning at present nowhere supplied but in Europe. The adoption of such a policy might, at first, reduce the number of students, and even require a concentration of means upon a less number of professional schools. But it seems to me certain, that the loss in numbers would be more than made up in both cases by the higher quality of the work done, and that the reputation of the institution that should be true enough and brave enough to make the trial, would be so enhanced thereby as to eventually, and at a period not remote, win to it, not only more students than formerly, but also liberal benefactions, now either withheld or divided among the many institutions of common desert, whose clamor for help is heard in every quarter. A preparatory department, paving the way to a university academic department, which, of itself, is nothing more than a preparatory school to a really respectable university, and employing the forces and means needed for true university work upon mere boys, who ought to be in the common school, is a disgrace to any institution either claiming, or aspiring to, the title of university. It is time that the managers of all our higher institutions should rise so far above pandering to the popular custom of judging of the success of a school by the number of pupils, without regard to quality or condition, as to shut their doors in the faces of all pupils not qualified to enter at once upon the study of such subjects as properly belong to institutions of that grade. A state university pursuing this course would at once create a demand for more and better training in the colleges and high schools; the high schools, in turn, would exert a like influence upon the schools below them; and thus the whole system of schools in the state would be vitalized and raised to a higher level. One thing is certain, such a central institution cannot exist and not exert an influence. It rests with those who shape its policy to determine whether that influence shall be one of repression and degradation, or of stimulation and exaltation.

But our so-called universities in this country are no less faulty in the brevity of their courses of study. They have become so imbued with the rushing, headlong spirit of the times, that they have ceased to insist on thorough and complete work. They might properly enough place over their doorways this inscription: "Scholars made to order on short notice." It may be necessary for them to open their lecture rooms, libraries, museums, and laboratories to many who, for various reasons, cannot remain long enough to complete a thorough course of study. But then the few who do want such a course are just as much entitled to it as are the many to the partial privileges they demand. Why should not all be accommodated? But whatever else is done, or not done, this must be borne in mind, namely, that *the primary end of the university is the higher culture.*

Let the door be open to him as an auditor who would know a little more of many things, or a good deal more of some one thing, than he now knows; but let him alone become a member of the university and the recipient of its honors who is willing to earn them.

The degrees conferred by our universities are substantially the same, it will have been observed, as those conferred by European institutions, though the attainments they represent are, of course, as much less in amount as the institutions themselves are inferior. That the educational institutions of a new country like ours, in which grand material enterprises first press upon almost the whole population with the weight of a necessity, should be slow in attaining the ideal standard, in so far as their progress is determined by the abundance of pecuniary means, is hardly surprising; but that the honors, which, at the world's centers of learning, attach to fixed minima of intellectual culture and knowledge, should be so far degraded as they are in this country, merely to gratify the overweening pride of the half-cultured majority who annually go out from our universities with the highest titles it is in the power of the best institution in the world to confer—this is wholly without reason or excuse. Men of the profoundest and highest culture we have in America, it is true—men whose scholarship, no less than their native genius, adds luster to their country, and to the letters and science of the age—men worthy of the highest honors that can be accorded them by authority of the state—but the honors actually conferred by our universities are by no means confined to this, as yet very small, class of American scholars. Every year our multitude of petty colleges known by the high-sounding title of university, but really able to furnish nothing more than the mere rudiments of learning, send out their swarms of bachelors and masters, and with a most profuse hand distribute even the highest honorary doctorates to men, scarcely one in one hundred of whom is possessed of either the culture or knowledge represented by the German "certificate of maturity." The explanation of this worse than absurd practice, this outrage upon the cause of the higher education, is found partly in the gross ignorance of boards of management, which often renders it impossible for them to conceive of, much less to appreciate, a true standard of high culture, and partly in the poverty of the institutions they represent, by reason of which, in the absence of anything like the *wissenschaftliche Geist* of the continental universities, they are controlled by the sordid motive of helping their pecuniary fortunes.

It ought to be established as a principle, in the incorporation of all classes of educational institutions, that the degrees authorized should in no case represent a higher culture than is fairly represented by the institution itself. And then, if there could be no actual conferring of honorary degrees of any sort without the concurrence of the faculties themselves, the present evil would be so far corrected that educational titles would cease to be a laughing stock among all truly educated men, and again

become reliable evidence of scholarship and the honored badges of the most solid merit.

Thus far the remedy for the contempt, in which our higher—even our highest—institutions of learning in this country are held at the world's educational centers, is clearly in the hands of the institutions themselves. But it is not enough that our too pretentious schools and universities be brought to a true and honest dealing with the public; their poverty of means, which, without a single exception, stands as a barrier in the way of their promptly rising to the European level, lies at the root of the whole matter. This can only be overcome by the will of the people, manifesting itself, either in individual benefactions or in more liberal donations and appropriations made by the State and national governments. We seem, as yet, to have, in America, no just judgment as to the means requisite to the endowment and maintenance of a first-class institution of learning of any sort. And the result is that our colleges, professional schools, and would-be universities are left to the alternative of maintaining a beggarly and sickly existence on foundations less in the total amount than the annual income of many a university in the Old World, or of dying out altogether.

The government of the United States has done so nobly in the matter of donating lands for the endowment of common schools, and for the aid of scientific and collegiate institutions, that the State governments and the people have fallen into the serious error of supposing that nothing more is needed to insure their success; whereas the truth is, there is not so much as one institution of the higher class in the whole land whose income is half equal to the demands made upon it, or even to the work it actually assumes to do. Harvard is foremost in this regard, its available annual income being, as we have seen, a little over $100,000; and yet its president, professors, and managers are painfully conscious of its deficiencies in every department. If the income were even two or three times as great as at present, this institution—at least if developed on the present plan—could then only approximate the efficiency and greatness of some of the European universities.

Again, I say we must not allow ourselves to be deceived by outside appearances, and so take to ourselves the flattering unction that university education in America is in a highly creditable and prosperous condition, while there is, in fact, no such thing among us. The imposing array of distinct departments presented by a few of our so-called universities and university colleges, and their voluminous catalogues of students are gratifying evidence of the intellectual activity of our people, of a growing appreciation of the equal rights of all classes to the means of acquiring a knowledge of the principles that underlie their respective pursuits in life; but they afford little ground for judging of the amount of the higher culture to be had in the schools of the country, for the reason already hinted at, namely, the low standard of admission and the brevity of the professional courses of instruction.

Harvard and Yale may boast of a thousand students each, and the University of Michigan, most numerously attended of all the institutions of learning in this country, may have upon its annual catalogue twelve to fifteen hundred names; but, if the best cultured of these several hundreds rank no higher than the advanced pupils in a German gymnasium or a French *lycée*, while three-fourths or four-fifths of the whole number are gathered up by the schools of law and medicine from among the most uncultured young men of the country, given a superficial view of their respective fields of study, and then sent out to further degrade the standard of those professions, where is the credit?

To tell the plain truth, the very best of our many universities are but sorry skeletons of the well-developed and shapely institutions they ought to be, and must become before they will be fairly entitled to rank among the foremost universities of even this present day. And if we are not content always to suffer the contempt of European scholars, who properly enough regard us as a very clever, but also a very uncultured, people, it is time that all true lovers of learning, as well as all who desire the highest prosperity and glory of our common country, should awake to the importance of at once providing the means of a profounder, broader, and higher culture in every department of human learning.

Let us have, without further delay, at least one real university on the American Continent. And if no one of the individual States, aided by the beneficence of friends of learning throughout the country, is equal to the great work of building up such an institution, then let the national government again extend its helping hand and meet this greatest present need of American education.

CHAPTER XIII.

LEADING TENDENCIES OF UNIVERSITY EDUCATION.

MODIFICATIONS OF UNIVERSITY EDUCATION—INSTRUCTION IN THE FINE ARTS—GENERAL TENDENCY OF AN INCREASED SCOPE OF INSTRUCTION—UNIVERSITIES SHOULD HAVE FOR THEIR OBJECT NOT ONLY THE DIFFUSION OF KNOWLEDGE BUT ITS EXTENSION—TENDENCY TO EXPANSION BY DIVISION OF FACULTIES—CONCENTRATION OF MEANS AND INTELLECTUAL STRENGTH IN A FEW GREAT INSTITUTIONS.

We have seen that the German idea of a university—which is the nearest perfect yet realized—is that of an institution affording the highest and most thorough general culture, in connection with the best instruction and training for the more intellectual professions. The careful reader of the preceding chapter has also noticed a recent disposition to bring other departments than those of theology, law, and medicine within the pale of the learned professions, and thus to extend the area of university education by the incorporation therewith of more or less perfectly developed schools and faculties not formerly included. Political economy and statesmanship are thus making advances toward an ultimate, and indeed an early, recognition as a complete and independent faculty. The universities of Munich and of Tübingen already afford examples of this sort. The fine arts are likewise advancing their claims to a place in the university beside the recognized professions; and the day is probably not very remote when the great schools of art in both the Old and the New World will constitute university faculties. On this side of the Atlantic, Yale College, Michigan University, Washington University at St. Louis, and perhaps several others, have already inaugurated this important change in the constitution of the American university. Moreover, in connection with several of the great German universities, as heretofore stated, and with some of the Italian, various schools of the scientific and more material professions, such as schools of agriculture and of engineering, as well as of veterinary science and of pharmacy, have been established; while the Swiss Federal University at Zurich, the Danish University at Copenhagen, and the Finnish University at Helsingfors, have, of late, each been materially transformed and enlarged by the development therein, or the consolidation therewith, of more or less comprehensive polytechnic schools. Our American universities—those of them, I mean, in which there have been established colleges of agriculture and the mechanic arts—are not without precedent, therefore, as to this mode of enlargement, this innovation upon the constitution and scope of the ancient university.

This same spirit is also manifest, though in a less marked degree, in

the English universities, in whose behalf an effort is now making, first, for the restoration of the old faculties of law, medicine, and theology; and, secondly, for the creation of new departments of study, such as history, political economy, and the fine arts—destined, in course of time, to become full faculties, equal in rank and honor with the others.

It may be assumed, therefore, that a present leading tendency of the university is to an enlargement of its scope by bringing within the range of its educational work the whole circle of superior and special studies, regardless of the relative rank they have heretofore held in the world's estimation. And while it hardly requires a word of argument to show how truly such enlargement is in harmony with the spirit of the age and with the educational wants of the industrial classes, there are certain questions connected with the organization of the new schools thus incorporated, the importance of which is so vital as to require the most careful consideration; for if, by enlarging its scope, we are to degrade the university from its ideal rank as an association of professional schools, bound together by the strong attractive force of a central school or schools of general culture, in which the *wissenschaftliche Geist*, the scientific spirit, of the German university is the animating and controlling principle, and make it a mere aggregation of inferior schools established in the interest of the *Brodwissenschaften*, or bread-and-butter sciences, and loosely held together by a community of sordid aims—if such were the inevitable result of an extension of the boundary lines of the university, then it were a thousand times better that the present narrow limits should remain unchanged, and that the schools of the practical sciences be grouped together on a separate foundation of their own, after the manner of the great separate polytechnicums of Europe or the Industrial University of Illinois. I mean to say, in other words, that the university, as the fountain-head of true learning of every sort, must be maintained at a high level and kept pure at all hazards. It is thus, and thus only, that the intellectual supremacy of a people is either attainable or maintainable; and, accordingly, it is a matter of the greatest moment to determine whether the expansion now in progress must of necessity lead to a degradation of the university standards. Touching this question, there will doubtless be a difference of opinion as to its susceptibility of *à priori* settlement. But, to my mind, no proposition not already placed beyond dispute by actual demonstration is clearer than that it is possible to open the door of the university to every one of the higher branches of study and every one of the numerous professions that engage the intellectual efforts of man, without the least sacrifice of its high character. How should it be otherwise? It is not the sciences alone that are correlative; there is a correlation of all the knowledges, to what domain soever they severally belong; and in their higher range the relation is one of equality of rank, not of diversity. If the votaries of one set up for it a higher claim because, forsooth, in its sublime elevation, it is altogether above the range of the practical, it is because of the

narrowness of their limitations—because they have not yet learned that all knowledge and every kind of learning that is worth anything is both theoretical and practical, and either the one or the other according as it is studied in its essence or in its extension into the sphere of human activities—because they have not yet learned that great yet simple lesson, the essential unity and harmony of all truths, so that it is impossible for any man to know the whole of any one thing until he has gained the mastery of all things. And if, on the other hand, the industrial classes are so generally contemners of the abstract and theoretical, and worshipers of the practical, it is because they have been so long cramped, fettered, and blinded by narrow and foolish notions of an essential antagonism between the different classes of society, and between the different departments in the world of letters, science, and the arts—because they have not yet stood upon a plane of intelligence high enough to see that the real interests of any class are so wisely and beautifully interwoven with the interests of every other, that, practically, the good of one is the good of all; that even the most practical of all the practical sciences has, of necessity, its source in the abstract and theoretical; and that as, in truth, all branches of knowledge are essential parts of one complete system, so the growth and completeness of each is promoted by the utmost intimacy and equality of association.

It seems to me that this very nature of the relation that exists between all the departments of learning, confirmed, as it is, by the known liberalizing power of such association upon the minds of all who are brought within the circle of its influence, is, of itself, convincing proof, not only of the desirableness, but also of the practicability and wisdom, of so enlarging the scope of the university as that it shall become, not in title merely but in reality, a central source of universal knowledge.

May we not consider it settled, then, that this the leading tendency of university education at the present day is philosophical, and therefore entitled to encouragement? Undoubtedly. But encouragement is not all that is wanted; the movement is eminently in need of the guidance of practical wisdom. The uncultured world, seeing, not the secret sources of knowledge and the tedious processes by means of which it has been reached, but only the results, lacks appreciation of profound culture, and is impatient of thorough and protracted courses of study. Leave the university in such hands, and everything would be contemptuously thrown out, with the brand of "useless," that could not yield immediate practical, and for the most part material, results; the branches and departments allowed to remain would be reduced to the narrowest possible limits; all subordinate institutions, from the college down to the primary school, would be correspondingly degraded in their standards; learning and science would quickly degenerate into a pitiful charlatanism; and the most rapidly advancing civilization lapse into a hopeless barbarism.

Here, then, we have the means of security. The university must be

made not only a central source of proved and accepted knowledge, but also a central place of universal culture—an institution a recognized and important office of which shall be to search for and discover the yet concealed truths that wait for new explorers in the universe of mind and matter. It must have for its object the extension as well as the diffusion of knowledge. And its ideal results must be, not simply the learned theologian, lawyer, philologist, and physician; nor yet these supplemented by the successful agriculturist, the skillful architect, the practical engineer, and that entire host of well-trained professional workers who constitute the visible vanguard of the great army of material progress; nor yet a great people, provided with the best conditions of material development, luxuriating in the wealth of its own production and rejoicing in the superiority of its physical power; its ideal results must also, and above all else, include the highest type of individual manhood and a nation pre-eminently distinguished for the high quality of its intellectual culture and the grandeur of its moral influence on the rest of the world. Again, I say, degradation of the university is liable, nay almost certain, to follow in all cases where the idea of a profound and exalted culture is subordinated to the idea of direct practical availability. But insure to the former its legitimate central place in the comprehensive scheme, make the high faculties of general science and philosophy the heart and soul of the whole institution, and it will surely become a vitalizing and elevating influence, holding its "practical" no less than its professional faculties to a higher standard than, as isolated schools, they could possibly attain.

It is needless to say that in America, where, as yet, we have no high faculty of philosophy, and where there is so little of the *wissenschaftliche Geist* in any quarter, and hence so little elevating and sustaining power, there is little danger of a degradation of university standards, for the reason that they are already, and always have been, about as low as they could be got. But does not this very fact, so discreditable to our country, constitute a powerful argument in favor of at once creating such faculties in all our would-be universities, both on their own account and because of their needed influence on the professional faculties, new and old? One thing is certain, namely, that unless measures are promptly taken for the creation of such faculties, that same superficialness which now marks the professional schools of the country will continue to characterize them. Nor will this be the worst of the case; for if our American universities are to continue in their present course of expansion by multiplication of professional schools, without the required improvement in their standards, instead of fulfilling the important office of stimulating and lifting up the colleges and the public schools of the country—an office of the utmost importance, and one for the thorough fulfillment of which they should be held responsible—they are almost certain to degrade them, as a class, even below their present inferior level.

At Yale and Harvard there are signs of an earnest desire to supply this great want of American education; but unless I have misapprehended the present character and objects of the few brief and disconnected courses of lectures thus far offered to their students and to the public generally, they constitute but a single first step of the many that require to be taken, before we shall be able to point to even one faculty of philosophy corresponding in rank to the *philosophische Facultät* of the German university.

But expansion of the university is not likely to stop with the incorporation of new faculties. There is also discoverable a tendency to expansion by the division of existing faculties. In some instances the new faculties amount almost to the creation of a new department, great in its importance and extensive in its scope, around the nucleus of a single branch of study formerly included in one of the ancient faculties. In other cases the new faculties are formed by a natural and equal division of the studies previously embraced in the faculty of philosophy or its equivalent, and the subsequent expansion of these divisions into full faculties, each covering a wider field and demanding of the student the same term of study as a condition of admission to the laureate, as was required previous to the division.

Examples of the first kind are presented by the *staatswirthschaftliche Facultät* of the Bavarian and Wurtemberg Universities, which is an offshoot of the *juristische* or *Juristen Facultät*, as may be seen by reference to the University of Vienna, in which political philosophy, though not yet advanced to the rank of an independent faculty, nevertheless has an important place in the law faculty, there known as the *rechts- und staatswissenchaftliche Facultät.* The schools of engineering, of agriculture, of veterinary science, of pharmacy, &c., already noticed as having, within late years, sprung up in many of the universities of the Old World, also properly belong to this general class.

Examples of the second class—of new faculties formed by the equal division of the original faculty of philosophy, so long the foundation school of the European university, into schools of philosophy and letters, and schools of the mathematical, physical, and natural sciences—are still more common, being found in many countries. Thus in Italy, instead of the ancient faculty of philosophy, we now have, as the basis of the professional faculties, the *facoltà di filosofia e lettere*, and the *facoltà di scienze, fisiche, matematiche e naturali;* in France, the *faculté des sciences* and the *faculté des lettres;* in Belgium, the *faculté des sciences* and the *faculté de philosophie et lettres;* in Denmark, the *philosophiske Facultet* and the *mathematisk-naturvidenskabelige Facultet;* in Holland, the *facultas disciplinarum mathematicarum et physicarum* and the *facultas philosophiæ theoreticæ et literarum humaniorum;* in Russia, the historico-philological faculty and the physico-mathematical faculty. So likewise in this country the same tendency, though on a lower plane and without the same necessity, is observable in the division of the uni-

versity department of general culture into the "regular" or classical and the scientific courses that exist in so many of the universities; while in at least one—the University of Wisconsin—there are found distinct and co-ordinate colleges or faculties of letters and of science and the arts.

Now, if this multiplication by division were nothing more than a partition of studies, with an assignment of the ordinary academic, mathematical, and scientific studies to one division, and the academic courses in language, literature, and philosophy to the other, it is clear that there would be not only no expansion whatever in such cases, but, on the other hand, an actual and very prejudicial contraction of the already too narrow range of studies the completion of which has been essential to the baccalaureate; and yet, practically, it is, with few exceptions, this very partitioning of studies that is now going on in this country. In the European countries, however, the division is either a real expansion, by taking in new studies and extending the upward range of the old ones, or at least a systematic and philosophical arrangement of the numberless studies embraced by the full faculty of philosophy, according to the somewhat different needs—at this advanced stage in the student's life quite beyond the *academic* range—of those who are preparing for the "learned" or for the scientific and "practical" pursuits.

That the faculty of philosophy in the German university has not yet undergone a division similar to those found in the other European countries is doubtless due to the limitless range of this faculty, to the singular freedom of choice allowed to all who attend the courses of instruction embraced, and to the more liberal, though by no means more easy, terms on which the doctorate in this faculty is conferred. Still another reason may be found in the fact that, in Germany, the university is still almost exclusively a door to the "learned" pursuits; admission to the scientific and industrial pursuits being gained chiefly through the technical, industrial, and polytechnic schools, in all of which the German States so far excel. And yet, notwithstanding these peculiarities of the case in Germany, it is by no means clear to my own mind that the university there is not susceptible of improvement by the proper organization of two separate faculties, similar in general cast to those found in the other countries named. Nor is there much doubt that such a change will come, in course of time, with the organization therein of the new faculties of the scientific professions. That freedom of the German university, which, opening the vast domain of letters, science, and philosophy to all who choose to enter upon and occupy it, bids them choose for themselves such range of study as seems most in harmony with their individual tastes and aspirations, and allows them to continue therein even to the end of their days, is most admirable, surely, and should be fostered and protected with the most jealous care. But for such students as have fixed and definite aims sharply outlined, both by their bent of character and the uncompromising necessities of life, there

is doubtless an advantage in finding, already formed, such groupings of studies as have been determined by the wisest educators, and proved by the experience of years to be best calculated to perfect their preparation for their respective callings in life—that is, if we may assume that the student, still feeling his way and only advancing by the aid of others, is less wise than the master, already familiar with the great highway, and even the by-ways, his feet have need to tread.

Intimately connected with this organization of faculties we have the question of discipline; concerning which, however, I deem it important to say only this much, namely: that the manifest and true tendency is a fair compromise between the rigid rule of the French and English universities on the one hand and the extreme license of the German university on the other; neither of which secures the best results. These contrasting policies have naturally grown out of the different governing ideas that characterize the universities of those countries respectively, and which, indeed, are essential to their differences in grade and real character. For the English university, as already shown, is only a *haut lycée*, and in no proper sense a university at all. It proceeds, therefore, upon the hypothesis that the students who resort to it are still boys, whose object is elementary culture and discipline, and whose need is the stimulation of examinations and high prizes and the severe restraints and penalties imposed by arbitrary authority. Whereas the German university is based on the theory that they who resort to its halls are young men already disciplined in mind and fashioned as to habits of intellectual and moral life, and hence duly prepared to enter upon their career of superior study in that true scientific and philosophic spirit whose glory is that it lifts the student by its own inherent power of inspiration high above all need of arbitrary rule and artificial stimulation.

That neither of these theories is perfectly adapted to the end proposed is apparent after a careful investigation; for, in England the proportion of students who attain to anything more than a *pass* degree, or even entitle themselves to that, is very small, while at the best of the German universities it is rare that more than a third of the whole number manifest their possession of the true *wissenschaftliche Geist* by continuous laborious effort during their period of study. Even at Berlin the scientific spirit which animates the whole institution and gives vitality and power to its teaching in every department, fails with the majority to supply the place of official and professional supervision. To the authorities of this, the foremost of the world's universities, it may with propriety be said, "This ought ye to have done and not left the other undone." The scientific spirit is above all price; but even the University of Berlin would accomplish yet more if, to its magnificent material and intellectual provisions for the education of the thousands who throng its famous lecture rooms, there were added such requirements as to attendance, and such frequent tests of progress and profi-

ciency as have ever been found essential to hold the less ambitious and as yet uninspired majority of students to their work.

The English methods being simply a perpetuation of past errors, the French a system begotten of the too military spirit of the nation, and the German policy a natural reaction upon the too rigid systems that had been long in vogue when it was adopted, it is not strange that the leading educators of these and of other countries are at present earnestly striving to determine the golden mean.

Touching the organization of the professoriate, one risks nothing in conceding that the German universities, including the Swiss and Austrian, present the best models; and the wonder is that these have not been already universally adopted by other countries. Extraordinary professors, performing the office of assistants, with moderate salaries or half salaries, and thus supplementing the instruction given by the ordinary professors, at a considerable saving to the funds of the institution, are found, indeed, in all the European universities; but the *Privatdocenten*, giving private lectures on subjects of their own choice, dependent entirely upon their own powers of attraction for auditors and compensation, and powerfully stimulating both extraordinary and ordinary professors, for whose private pupils and fees they are authorized competitors, and for whose very places even they may be aspirants—these are a class of teachers peculiarly German, and a class of whom, in view of the great saving they make to the university, and the quickening and vitalizing influence they exert upon every department and member thereof, it is not too much to say that they are the most important class at present belonging to the university corps of instructors. That so important a feature of the professoriate as this is destined to be adopted at an early day, wherever practicable, seems to me almost certain. But with all the economy that may be used, in their organization and management, it is coming to be understood that it is not possible in any country to establish and maintain a real university without vast sums of money. And accordingly there is observed a corresponding tendency in those countries where the true idea of a university is best comprehended to a concentration of means and intellectual forces in a few great institutions, rather than practically squander them upon a great number of half-endowed, sickly institutions, which are not only not worthy of their high title, but whose meagerness and necessary imperfections constitute them a positive hindrance and curse to the cause of university education. It was the want of a due appreciation of this that led to the establishment in early times of so many universities in Italy and Germany. It will be remembered that as early as the year 1500 Germany alone had fourteen, and that the number continued to increase for a long time after that; every town of the second or third rank insisting on having its university, until at last, yielding to the contempt in which the majority of them had long been held by the learned men of the times, happily sustained by the necessary territorial changes that came of the

political commotions of the eighteenth century, those of them whose life was most sickly, such as those of Erfurt, Mainz, Helmstadt, Frankfort-on-the-Oder, Rinteln, Duisburg, Bamberg, Cologne, Munster, Paderborn, Dillingen, and Salzburg, were suppressed.

Italy, whose mania for numerous universities had run *pari passu* with that of Germany, has not even yet effected the requisite work of suppression. The need of such work has long been felt by leading minds, however, and has at length been fairly undertaken by the government, whose purpose it is, by reducing the number of state universities from fifteen to about half the number, and by the adoption of more thorough regulations for their management, to raise them to the high level of the foremost universities of Germany.

So, also, there is, of late, a growing appreciation in Great Britain of the importance of a more judicious concentration of means upon a less number of institutions, in order to the upbuilding of such as shall be more worthy of the high demands alike made by the country and the times. In pursuance of this felt necessity, the Scotch universities are to be consolidated; Queen's University, Dublin, is empowered to grant the degrees heretofore conferred by the colleges at Cork, Galway, and Belfast; and the University of London is gradually absorbing the degree-conferring powers of a large number of similar institutions in England.

In this country alone, where the ambition of new cities and new States, as well as of numberless religious sects, strongly wars against this true policy of the higher education, the opposite tendency still prevails. But even here more rational ideas of what constitutes a true university, and of the large amount of money and professional talent requisite to maintain such an institution, are rapidly gaining ground; so that we may reasonably hope to see a check, ere long, put upon the present insane policy of multiplication without regard to the necessities of education.

It thus appears that university education, notwithstanding its present low condition in most countries, and its serious imperfections in all, is characterized by tendencies that promise great things for the time to come. So much is already beyond question, namely, that the university of the future is to be not the mere *college* of America, nor even the college supplemented by one or more poorly organized and more poorly equipped professional schools; not that loose aggregation of grammar schools, supplemented by a few poorly attended courses of university lectures, that wear the title, by courtesy, in England; not the French grouping of academical faculties, limited—especially in the departments of letters and science—to a quite too narrow field of study; not the university of Spain, or Portugal, or Italy, from whose faculties for the higher general culture the powers of attraction and inspiration have long since departed; not the Scandinavian or Slavonian university, cast in the mold of mediæval times, or at the best a mixture of the old

and more modern types; nor yet the Germanic university, found, with but minor modifications, in all the States of Germany, in Austria, Switzerland, Holland, and Denmark, and which, though wherever found it presents the highest existing type, is nevertheless everywhere too limited in scope and generally too lax in its regulations—not any of these, but rather an institution more ample in its endowment, broader in its scope, more complete in its organization, more philosophical and practical in its internal regulations, and certainly not less high than the highest in all its educational standards; an institution above and beyond the best of the gymnasia, Latin schools, high schools, academies, and colleges, and, on its own higher plane, existing for the extension and diffusion of all branches of knowledge; a broad and noble institution, where the love of all knowledge, and of knowledge as knowledge, shall be fostered and developed; where all departments of learning shall be equally honored, and the relations of each to every other shall be understood and taught; where the students devoted to each and all branches of learning, whether science, language, literature, or philosophy, or to any combinations of these constituting the numerous professional courses of instruction, shall intermingle and enjoy friendly intercourse as peers of the same realm; where the professors, chosen, as in France and Germany, after trial, from among the ablest and best scholars of the world, possessed of absolute freedom of conscience and of speech, and honored and rewarded more nearly in proportion to merit, shall be, not teachers of the known merely, but also earnest searchers after the unknown, and capable, by their own genius, enthusiasm, and moral power, of infusing their own lofty ambition into the minds of all who may wait upon their instruction; a university not barely complying with the demands of the age, but one that shall create, develop, and satisfy new and unheard-of demands and aspirations; that shall have power to fashion the nation and mold the age unto its own grander ideal; and which, through every change and every real advance of the world, shall still be at the front, driving back from their fastnesses the powers of darkness, opening up new continents of truth to the grand army of progress, and so leading the nation forward, and helping to elevate the whole human race. Such an institution would be to the world its first realization of the true idea of a university.

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